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Binder 026, Bucephalidae Prosorhynchinae [Trematoda Taxon Notebooks]

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Prosorhynchinae Nicoll, 1914

Subfamily diagnosis. — Bucephalidae: Body plump to elongate, spinose. Rhynchus sucker-like or somewhat plug-shaped. Pharynx variable in levels. Testes diagonal, near middle of body. Cirrus pouch comparatively large. Ovary pretesticular. Vitellaria largely or entirely anterior to ovarian zone. Excretory vesicle tubular, long or short.

Key to genera of Prosorhynchinae

1. Body plump; rhynchus plug- or funnel-shaped; excretory vesicle short ..... *Prosorhynchus*
   Body elongate; rhynchus sucker-like; excretory vesicle long .. 2
2. Receptaculum seminis present ..... *Neobucephalopsis*
   Receptaculum seminis absent ..... *Bucephalopsis*

Prosorhynchus Odhner, 1905 [1])

Syn. *Mordvilkovia* Pigulewsky, 1931

Generic diagnosis. — Bucephalidae, Prosorhynchinae: Body plump to elongate, spined. Rhynchus plug- or funnel-shaped, without tentacular appendages. Mouth opening usually in middle third of body. Intestine short. Testes tandem or oblique, in middle third of body or further behind. Cirrus pouch containing tubular vesicula seminalis and well developed prostatic complex. Genital lobe present. Genital pore ventroposterior or terminal. Ovary in front of anterior or posterior testis. Vitellaria anterior to ovary and testes, may or may not be divided into paired groups. Uterus ascending as far forward as vitellarian zone or beyond it. Excretory vesicle short or moderately long. Parasites of marine fishes, rarely of freshwater fishes. *Skrjabiniella* Issaitschikow, 1928 and *Gotonius* Ozaki, 1924, should be relegated to subgeneric rank.

Genotype: *P. squamatum* Odhner, 1905, syn. *Gasterostomum armatum* Molin of Levinsen, in *Cottus scorpius*, Sweden; also in *Liparis* spp., Europe; *Leptocephalus myriaster*, Japan.

Lebour (1908) suggests that *Modiolaria discors* is probably the first host and that the intermediate host is omitted. Cercaria in *Mytilus edulis*, metacercaria in *Liparis liparis*— Chubrik (1952).

Other species:

P. aculeatum Odhner, 1905, syn. *Gasterostomum crucibulum* Rud. of van Beneden, 1870, in *Conger vulgaris;* Mediterranean, Belgium, Sweden. Also in *Conger myriaster, Rhinogobius, Pseudorhombus,* Japan; *Gymnothorax* sp., Galapagos Isl.

Larva encysts in fins of *Pseudorhombus cinnamomeus* — Yamaguti (1937). Metacercaria in *Gobius minutus, G. jozo, Crenilabrus massa*— Carrère (1938). Also in gills of *Sparisoma cretense;* Senegal— Dollfus (1951).

P. aguayoi Vigueras, 1955, in *Rypticus saponaceus;* Cuba.

P. apertum McFarlane, 1936, syn. of *P. facilis* (Ozaki) — Nagaty (1937), in *Ophiodon elongatus;* Canada.

P. arabianum Srivastava, 1937, in *Synaptura pan;* Arabian Sea.

P. atlanticum Manter, 1940, in *Mycteroperca bonaci, M. microlepis* and *M. venenosa;* Florida.

P. caudovatum Manter, 1940, for *P. crucibulus* of Eckmann, 1932, in *Epinepheles* sp.; Suez.

P. chorinemi Yamaguti, 1952, in *Chorinemus moadetta;* Macassar.

P. costai Travassos, Artigas et Pereira, 1928, syn. of *P. crucibulus* (Rud.) — Nagaty (1937), in *Acestrorhamphus* sp., *Astyanax fasciatus* and *Salminus hilarii;* Brazil.

P. crucibulum (Rud., 1819) Odhner, 1905, syn. *Monostomum crucibulum* Rud., *Gasterostomum armatum* Molin, *G. crucibulum* Olsson, in *Muraena conger*, Mediterranean, England, and Woods Hole; also in *Conger myriaster*, Inland Sea of Japan; *Muraenesox cinereus*, China; *Serranus* sp., Red Sea; *Polynemus operacularis*, Panama.

P. elongatum (Pigulewsky, 1931), syn. *Mordvilkovia e.* P., in *Esox lucius;* Dnjeprbassin, Russia.

[1]) Neuter in gender. See Copenhagen Decisions on Zool. Nomencl. 1953, p. 51.

P. epinepheli Yamaguti, 1939 (Pl. 1, Fig. 6), in *Epinephelus akaara;* Inland Sea, Japan.

P. facile (Ozaki, 1924) in *Inimicus japonicus;* Inland Sea and Toyama Bay; also in *Seriola aureovittata* and *Lethrinus haematopterus;* Inland Sea, Japan; *Caranx* sp., Red Sea.

P. freitasi Nagaty, 1937, in *Serranus gutlatus;* Red Sea.

P. gonoderus Manter, 1940, in yellow-spotted grouper; Pacific.

P. grande Lebour, 1908, syn. of *P. crucibulus* (Rud.) — Nagaty (1937), in cod and whiting; Northumberland coast.

P. longicolle Yamaguti, 1953, in *Sphyraena* sp.; Macassar, Celebes.

P. magniovatum Yamaguti, 1938 (Pl. 1, Fig. 11), in *Conger myriaster,* Inland Sea of Japan.

P. manteri Srivastava, 1937, in *Tetrodon oblongus;* Bay of Bengal.

P. ozakii Manter, 1934, in *Epinephelus niveatus;* Florida. Also in *Mycteroperca olfax, M. xenarcha* and spotted grouper-like fish; Pacific coast of Mexico.

P. pacificum Manter, 1940, syn. *P. atlanticus* Manter, 1940 — Hanson (1950), in *Mycteroperca olfax* and *M. xenarcha;* Galapagos. Also in *Sebastopyr ruberrimus,* Bermuda; *Triscitopis venenosus apua,* Cuba.

P. promicropsi Manter, 1940, in *Promicrops itaiara;* Florida.

P. rotundum Manter, 1940, in *Rypticus safronaceus bicolor;* Galapagos.

P. scalpellum McFarlane, syn. of *P. crucibulus* — Nagaty (1937), in *Scorpaenichthys marmoratus;* Canada.

P. thapari Manter, 1953, ? syn. *P. facilis* (Ozaki) of Nagaty, 1937, in *Plectropoma maculatum;* Fiji Isl.

P. triangulare Tubangui et Masilungan, 1944, in *Glossogobius giurus;* Philippines.

P. triglae Nicoll, 1914 (sp. inq.), in *Trigla gurnardus;* English Channel.

P. truncatum Verma, 1936, in *Arius fatius;* Bay of Bengal.

P. tsengi Tsin, 1933, syn. *Gotonius platycephali* Yamaguti, 1934, in *Platycephalus indicus;* China and Toyama Bay, Japan.

P. uniporus Ozaki, 1924, syn. of *P. aculeatus* Odhner, 1905 — Manter (1940), in *Leptocephalus myriaster;* Japan.

Larva encysted in fins of *Callionymus lunatus, Acanthogobius flavimanus;* Hamana-ko, Japan — Yamaguti (1937, 42). Cercaria (*Bucephalus tlabo* Ozaki) develops in *Ostrea denselamellosa,* encysts in *Pleuronichthys cornutus,* adult in *Leptocephalus myriaster* experimentally — Ozaki (1954).

Key to species of *Prosorhynchus* from Hawaiian fishes

1. Body slender, with all internal organs in posterior half of body 2
   Body more or less fusiform, with all internal organs not confined to posterior half of body 3
2. Neck region markedly attenuated . . . . . *P. longicollis*
   Neck region not attenuated . . . . . *P. kahala*
3. Pharynx in vitellarian zone . . . . . *P. berycis*
   Pharynx posterior to vitellarian zone 4
4. Seminal vesicle and proximal portion of pars prostatica looped 5
   Seminal vesicle and proximal portion of pars prostatica not looped 6
5. Vitellaria extending transversely; genital lobe 3-lobed distally . . . . . *P. congeri*
   Vitellaria forming an arc; genital lobe 2-lobed distally . . . . . *P. polydactyli*
6. Rhynchus shaped like an inverted cone, without apical depression; pharynx pre-equatorial . . . . . *P. epinepheli*
   Rhynchus pad-like, with slight apical depression; pharynx postequatorial . . . . . *P. uniporus*

PROSORHYNCHUS Odhner, 1905

Organ of attachment at the anterior end a rhynchus. The vitellaria on both sides meet medianly and form a convex bow in the forebody. The relatively small sex papilla is not penetrated by the extremely short ductus ejaculatorius since the male genital pore is found ventrally at its base. The cirrus sac is inserted distally not directly at the male duct itself but to the wall of the genital sinus at a distance from the ductus ejaculatorius. In contraction then not only the sex papilla is affected but also the remaining parts of the genital sinus lying inside the line of attachment of the cirrus sac of which there occurs a small fold ventral to the male sex pore extending into the sinus. The everting of the ductus ejaculatorius must therefore occur as in Gasterostomum. Seminal vesicle tube-like, forming a coil. Spherical stalked spermatophores are formed by glands opening into the genital sinus.
Type species: P. squamatus Odhner, 1905

Other species:

P. crucibulus (Rud.) Odhner, 1905
P. aculeatus Odhner, 1905
P. grandis Lebour, 1907
P. uniporus Ozaki, 1924
P. facilis (Ozaki, 1924) Eckmann, 1932
P. ozakii Manter
P. costai Trav., Artigas & Pereira
P. platycephali (Yamaguti)
P. apertus Mc Farlane, 1935
P. scalpellus Mc Farlane, 1935
P. manteri Sriv.
P. arabiana Sriv.

? P. triglae Nicoll, 1914 is sp. inq.

P. triangularis Tubangui & Masilungan, 1944
P. pacificus Manter, 1940
Syn. P. atlanticus " "
P. epinepheli Yamaguti, 1939
P. freitasi Nagaty, 1937
P. rotundus Manter, 1940
P. gonodactus Manter, 1940
P. magniovatus Yam., 1938
P. caudovatus Manter, 1940
P. chorinemi Yam., 1952

(over)

P. longicollis Yamaguti, 1953

PROSORHYNCHUS

I believe that some of the confusion in this genus is due to the acceptance of Eckmann's (1932) and Nagaty's (1937) synonyms of *P. crucibulus*. After a restudy of various species of this subfamily in my collections, I believe Jones (1943) is correct in placing emphasis on the "oval rhynchus" as compared with the "elongated rhynchus". The former is oval, disc-like or "lenticular"; the latter is tapered posteriorly, cone-shaped, or "cornucopia-shaped" as noted by Molin for *P. crucibulus*. Odhner (1905 : 305) found the type material of *P. crucibulus* he had was not in good enough condition to verify the shape of the rhynchus, but such a conical rhynchus has been generally recognized for this species. Thus, I still feel (Manter, 1940 : 334) that *P. squamatus* and *P. crucibulus* are different and that the former must stand as the type species. In fact *P. crucibulus* could well be considered in a different genus on the basis of its conical rhynchus. To do so, however, would involve so many changes in names that it does not seem wise at present.

Jones (1943) considered the oval rhynchus as an important character of *Skrjabiniella*. As Dollfus (1951 : 767) has noted, she made the mistake of including in *Skrjabiniella P. squamatus*, the genotype of *Prosorhynchus*. It seems more evident than ever that *Skrjabiniella* is a synonym of *Prosorhynchus*. Dollfus retained it, apparently separating it from *Prosorhynchus* solely on the position of the testes. Such a view does not seem justified because several species of *Prosorhynchus* have diagonal testes intermediate between the tandem and symmetrical position. *Gotonius* Ozaki, 1924 is also a synonym of *Prosorhynchus*, I believe.

Thus, there are two distinct groups of species in the genus as follows:

I. *With oval or lenticular rhynchus*. *P. squamatus* Odhner, 1905, the type species (Synonym: *P. grandis* Lebour, 1907); *P. aculeatus* Odhner, 1905 (Synonyms: *P. uniporus* Ozaki, 1924; *P. magniovatus* Yamaguti, 1938); *P. ozakii* Manter, 1934.

II. *With conical rhynchus*. In this group, I am inclined to recognize the following species: *P. arabiana* Srivastava, 1938; *P. atlanticus* Manter, 1940 (Synonym: *P. pacificus* Manter, 1940); *P. caudovatus* Manter, 1940; *P. crucibulus* (Rud., 1819) Odhner, 1905; *P. costai* Travassos, Artigas and Pereira, 1928; *P. epinepheli* Yamaguti, 1939; *P. facilis* (Ozaki, 1924) Eckmann, 1932 (Synonyms: *Gotonius facilis* Ozaki, 1924; *P. apertus* McFarlane, 1936); *P. freitasi* Nagaty, 1937; *P. gonoderus* Manter, 1940; *P. manteri* Srivastava, 1938; *P. platycephali* Yamaguti, 1934; *P. promicropsi* Manter, 1940; *P. rotundus* Manter, 1940; *P. scalpellus* McFarlane, 1936; *P. triangularis* Tubangui and Masilungan, 1944.

Other genera in the subfamily are: *Dollfustrema* Eckmann, 1934; (Synonym: *Dollfusina* Eckmann, 1932); *Mordvilkovia* Pigulewsky, 1931; *Neidhartia* Nagaty, 1937 (Synonym: *Pseudoprosorhynchus* Yamaguti, 1938); *Telorhynchus* Crowcroft, 1947; *Alcicornis* MacCallum, 1917. *Neoprosorhynchus* Dayal, 1948 seems to be distinct in having preovarian testes and a Y-shaped excretory vesicle. The latter was not figured and should be studied further as a truly Y-shaped vesicle is not known to occur in the family.

From Manter 1953

GOTONIUS Ozaki, 1924

Body cylindrical; anterior end truncated, posterior end rounded. Cuticle with spines. Rhynchus (or rostellum) terminal protrusible. Mouth ventral, near middle of body; without oral sucker. Pharynx globular. Intestine a short simple blind sac. Genital pore a short distance in front of posterior end. Testes post-ovarian. Cirrus pouch present. Ovary in middle of body. Seminal receptacle absent. Laurer's canal present. Uterus with ascending and descending limbs, extending from near the rhynchus to the genital pore. Vitellaria lateral, in front of the anterior testis. Excretory vesicle a simple long tubular sac. Pore terminal.

Type species: Gotonius facilis Ozaki, 1924

Gotonius considered a synonym of Prosorhynchus by Eckmann 1932 & by Nagaty (1937).
Yamaguti retains Gotonius

Species	Length	Width	Rostrum	Pharynx	Testes
P. aculeatus	1.2- 5	650-950µ	oval, simple 150-270µ	140u near post. ⅓ of body	Oval one on each side of body.
P. squamatus	1.3	½-¼ length	small oval 150-190µ	90-130µ middle of body	Ant. testis at right of pharynx post., median, dorsal
P. crucibulum	1.75-3.4	530µ - 1.3 mm	conical to almost rect. with long. & circul. musc.	In middle of body	One on each side of pharynx
P. triglae	2.2-2.4	750µ	cruciform 300µ	near mid. body 100µ	Post. testis near cirrus sac.
P. uniporus	1.2-1.7	520-700 u	120-140µ shallow, almost lenticular, weak muscles	In post. ¼. 80-120 µ	One on each side of body 200-300µ Left in mid body, ant to cirrus sac.
P. vaneyi	580-840µ	160-220µ	Conical, triple crown of spines	In post. 1/3 600µ	Elongated, irregular, one on each side pharynx, right more ant.

P. vaneyi to genus Dollfusina Eckman 1932
Dollfusina preoccupied, Eckman
names new name Dollfustrema Eckman 1934
Is this not a synonym of Mordvilkovia ?

Intestine	Ovary	Cirrus sac	Eggs	Host
Simple sac, barely reaching to mid-body	In mid-body, oval, to right	Left side post. to left testis	26-13 by 16-20µ	Intestine Conger conger
From pharynx to middle of vit.	Rounded, doral, in front of ant. testis	Left, just posterior to post. testis	29-32 by 20µ	Ceca: Cottus scorpius C. bulbaris Liparis montagui
Sac, extending to ant. third of body	Globular, to the right, in front of ant. testis	Left, post to testis	25-30 by 15-21µ	ceca: Leptocephalus myriaster Conger conger
Small, in middle of body	In front of ant. testis	Extending to the region of half the ex. vesicle	?	Int. & stomach Trigla gurnardus
Simple sac, extending to mid-body	Globular, in front of right testis. 120-180µ	Left. 110-170µ	23-26 by 17-18µ	Intestine Leptocephalus myriaster
Simple sac, extending in front of pharynx to vit.arc	Dorsal to the intestine and at its middle	Left. extending foward to middle of post.testis	?	Intestine Siniperca scherzeri

from Shen, Tseng. 1930
Sur un Gasterostomidae immature chez Siniperca.
Annales de Parasitologie
8: 554-561

SKRJABINIELLA Issaitschikow 1926

(from Issaitschikow 1928:23)

The mouth is in the posterior part of the body more or less distant from middle. The short intestine does not extend beyond middle of body. Testes on each side almost symmetrical, anterior on left, posterior on the right and opposite sides of midbody. Anterior to rigth testis lies the ovary. Otherwise like Prosorhynchus. Type species : S. aculeatus (Odhner) , synonym: P.aculeatus Odhner 1905

This genus is distinct in two cardinal features:

1. Almost symmetrical arrangement of testes on the sides of body. In Prosorhynchus they are on one side.
2. The mouth opening and intestine are localized in posterior part of body while in Prosorhynchus they lie in the anterior part.

These differences are sufficient in the opinion of Issaitschikow to form two groups. P.squamatus and P.crucibulum in one group, S. aculeatus in another.

See VanBeneden for picture of Skrjabinella and for description see Odhner 1905.

Synonym of Prosorhynchus (according to Nagaty, 1938

Prosorhynchus squamatus Odhner, 1905

Synonyms: Gasterostomum armatum Mol. of Olss. 1868
Gasterosotmum armatum Mol. of Levins. 1881

Length 1. to 1.15 mm. Body egg or pear shaped rounded at each end. Rostellum small, in contracted specimens about 0.15 by 0.09 mm. Skin covered with spines. Mouth in middle of body. Intestine in anterior half of body. Anterior testis to the right near the mouth, the other median behind it. Ovary directly in front of anterior testis. Vitellaria extend posteriorly on each side to level of ovary, but not reaching middle of body. Eggs 29 to 32 μ long. Cirrus sac to the hind testis. Excretory vesicle to the pharynx.

Host: Cottus scorpius

Locality: Sweden, Greenland

Distinuished from P. crucibulum by the small rhynchus and less elongate body.

Sweden

From Odhner, 1905

From Lebour, 1908

Peter the Great Bay (Japanese Sea)

From Layman, 1930

gonads linear

Brinkmann 1957 considers this species valid. Southern limit: Cape Cod. South Iceland, Norwegian west coast

Skrjabiniella aculeatus (Odhner 1905) (Figs. 1, 2, 9)

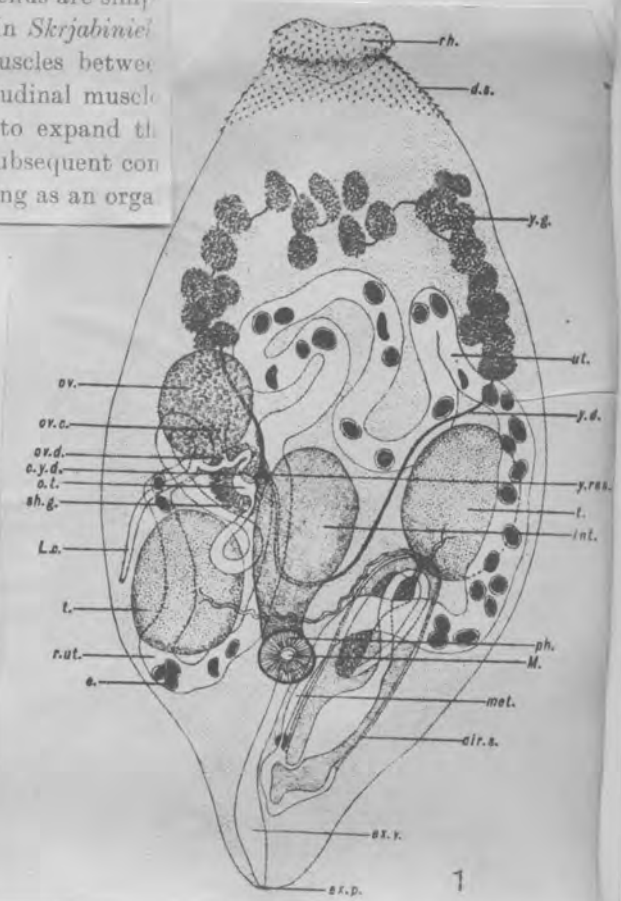
Synonymy. 1870. *Gasterostomum crucibulum* (Rud.).
1876. *Gasterostomum armatum* Molin.
1905. *Prosorhynchus aculeatus* Odhner.
1928. *Skrjabiniella aculeatus* (Odhner).

Skrjabiniella aculeatus was first described by van Beneden (1870) and later by Odhner (1905) and Nicoll (1910). None of the descriptions gave full details of histology especially of the genital ducts, and only van Beneden included a figure. The writer therefore proposes to give below an amplified account, with illustrations, based upon a study of whole mounts and serial sections.

External features (Fig. 1). The worm is almost elliptical, being slightly more pointed posteriorly and measures 1·3 × 0·66 mm. The body is only slightly flattened dorso-ventrally. At the anterior end is an oval rhynchus which when retracted is twice as broad as long, measuring 0·11 × 0·205 mm., giving the body a truncated appearance. The entire surface is covered by a thin cuticle which is armed by diagonal rows of large scale-like spines. The posterior ends of the latter are pointed and project through the cuticle at an acute angle. The spines on the rhynchus and anterior end measure 0·014 × 0·009 mm., while over the remainder of the body they are 0·011 × 0·008 mm.

The mouth is situated ventrally in the middle line about a quarter of the total body length from the posterior end. It is surrounded by a muscular region which has been incorrectly described as an oral sucker but which really lies in the wall of the digestive tube and is a large pharynx (Fig. 9). The genital aperture is situated ventrally behind the mouth, 0·176 mm. from the posterior end. The excretory aperture is at the extreme posterior tip of the body.

Muscular system. The musculature is typical, with circular, then longitudinal and then oblique muscles forming the body wall. The longitudinal and oblique fibres are arranged in bundles; the former cut each other at right angles and the latter meet at a more acute angle anteriorly than posteriorly, but the angle is always more than a right angle. Near the anterior end these muscles in the body wall is deflected in the region of the pharynx, which is further proof that there is no oral sucker. Dorso-ventral muscles are also present especially in the region of the intestine and genitalia. The muscles of the rhynchus are simple and resemble closely those of *Prosorhynchus uniporus* Ozaki (Table I). In *Skrjabiniella aculeatus* there is a thin muscular wall enclosing stout longitudinal muscles between which are loose parenchyma cells and unicellular gland cells. The longitudinal muscles appear to be arranged in ten bundles in sagittal section. These serve to expand the rhynchus so that it may reach the lining of the host's intestine; by the subsequent contraction of the central fibres a vacuum is created, the rhynchus thus serving as an organ



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of attachment. The gland cells probably secrete some substance which aids adhesion or possibly acts as an anti-ferment, since similar cells of smaller size are found beneath the musculature in all parts of the body. They are particularly numerous at the anterior end as noted by Ozaki (1928) in *Prosorhynchus facilis*.

Digestive system (Fig. 9). The oral aperture opens into a narrow tube which is directed anteriorwards towards the dorsal surface. The tube is 0·176 × 0·013 mm., and lined throughout by a cuticle continuous with that covering the external surface. It is divided into two portions equal in length; that nearest the oral aperture is the pharynx which has highly muscular walls forming a bulb 0·095 mm. in diameter, while the second half is the oesophagus with less muscular walls. Opening into the oesophagus are numerous

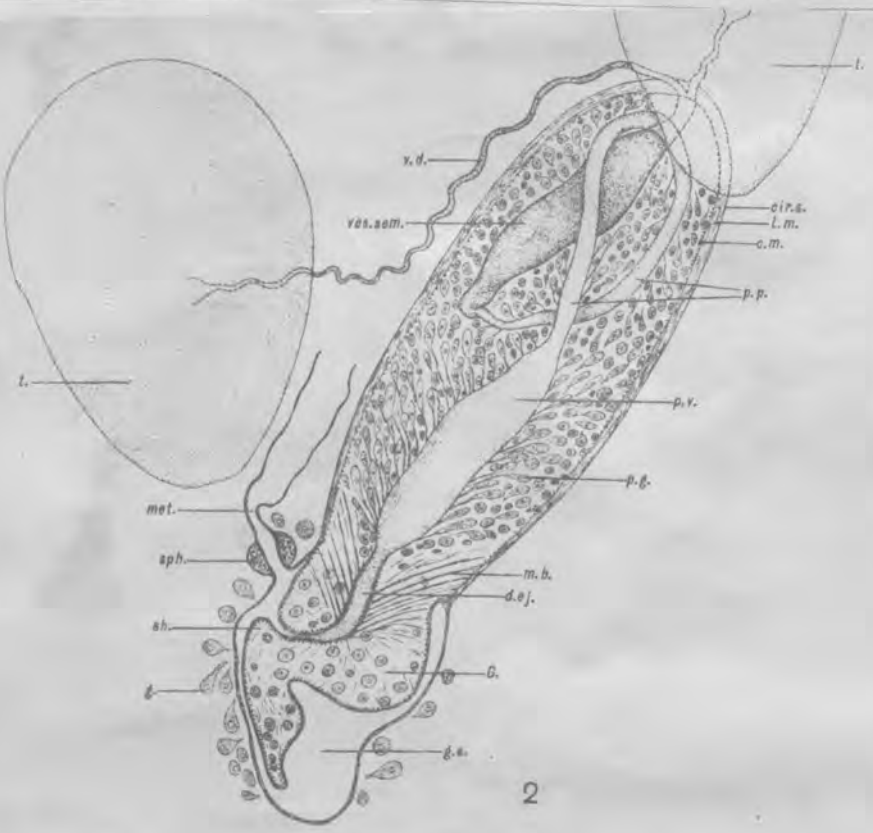


Fig. 2. *Skrjabiniella aculeatus*. Ventral view of male genitalia.

unicellular gland cells arranged in two lateral groups in the parenchyma. These probably secrete a digestive ferment. The oesophagus opens into a sacciform intestine 0·176 × 0·110 mm. with its blind end directed anteriorly. This has thinner walls than any other part of the digestive canal and is not lined by cuticle; it is therefore the absorptive region. The muscles in its wall are continuous with those of the oesophagus, pharynx and body wall so that the longitudinal fibres are outside the circular ones. The innermost lining of the intestine consists of small, closely packed epithelial cells which are columnar in shape with basal nuclei and distal vacuoles. They probably function for intra- as well as extracellular digestion, since many of them contain foreign particles.

Excretory system (Fig. 1). The posterior excretory pore leads into a wide vesicle situated dorsally and slightly to the left of the middle line. In the specimens examined it was traced only as far as the pharynx. It is fairly uniform in width with an internal lining membrane on the surface of which minute globules, probably, in part excretory products, could be seen in facial section.

Genital system (Figs. 1, 2). (1) *Male*. There are two testes, one on either side in the posterior half of the body, the left slightly in advance of the right. They extend through the entire thickness of the body and are longitudinally elongate measuring 0·220 × 0·231 mm. The right testis is close to the intestine with its posterior border on a level with the mouth while it is overlapped antero-dorsally by the female genitalia (Fig. 1). The left testis extends anteriorly to the middle of the body and is overlapped postero-dorsally by the anterior margin of the cirrus sac which is situated entirely on the left side of the body in this species.

The male sex cells escape by a narrow convoluted vas deferens which leads from the mid-dorsal region of each testis. Owing to the peculiar disposition of the cirrus sac the left vas deferens has a very short course while the right travels transversely dorsal to the oesophagus and then turns anteriorwards along the right border of the cirrus sac. Both vasa deferentia open into the latter at its anterior extremity where they join to form a vesicula seminalis 0·035 mm. broad with delicate muscular walls (Fig. 2). There is no part of the vesicula seminalis outside the sac as stated by Nicoll (1910), although such a condition is described by Lebour (1908) for *Prosorhynchus squamatus* Odhner (Table 1). The subsequent course of the male system is all contained within the cirrus sac which has a thick muscular wall consisting of stout longitudinal fibres on the outside and more delicate circular muscles internally. It measures 0·352 × 0·121 mm. The vesicula seminalis occupies a central position in the anterior half of the cirrus sac and communicates posteriorly through a narrow sphincter with the narrow pars prostatica with delicate muscular walls lined by relatively large, thin-walled, compact cells. The pars prostatica describes a complete loop in the anterior end of the cirrus sac, ventral to the vesicula seminalis, and then takes up a central position in the sac posterior to the latter. Here it widens to a diameter of 0·033 mm., forming the prostatic vesicle which is also lined by thin-walled cells. Opening into the pars prostatica and the prostatic vesicle are numerous unicellular prostatic gland cells, 0·017 mm. in diameter, which fill the remaining cavity of the cirrus sac. The prostatic vesicle opens abruptly into a short narrow muscular tube, the ductus ejaculatorius which measures 0·033 × 0·011 mm. and is bounded by outer circular and inner longitudinal muscles, the reverse of the arrangement in the wall of the cirrus sac. Inserted obliquely into its wall and terminating more anteriorly in the distal wall of the cirrus sac are four sets of powerful extrinsic muscles. The ejaculatory duct opens into the genital sinus immediately ventral to the female opening. This male aperture is at the base of a long, curved 'genital tongue' 0·035 × 0·007 mm., which occupies a dorsal position in the sinus with its distal tip pointing ventrally towards the common genital aperture. Proximally it bears a 'shoulder' which lies between the male and female openings. At the distal end of the ejaculatory duct, ventral and anterior to the shoulder, a rounded mass of sperms could often be seen in sections. The sperms appear cemented together probably by a secretion from the gland cells which surround the genital atrium and are abundant in the 'genital tongue'. Judging by its position it is probable that the latter functions also to prevent self-fertilization; it clearly cannot function as a penis since it is not penetrated by the ejaculatory duct. The genital sinus has a diameter of 0·110 mm. and opens by a small pore to the exterior.

(2) *Female* (Fig. 1). The ovary is situated on the right side of the body in front of and above the right testis. It is subglobular in shape measuring 0·154 × 0·143 mm. with its long axis running longitudinally. Histologically, it resembles that of other Digenea, the largest ova being 0·009 mm. in diameter. The most mature ova were found in the ovicap which is in the dorsal region of the ovary near its posterior border. It passes into a narrow oviduct 0·004 mm. broad which proceeds posteriorwards in a dorsal position. Immediately behind the ovary it receives Laürer's canal which is still more dorsal and has a diameter of 0·121 mm. It is lined throughout by pyramidal cells which present a trabeculate appearance in oblique section. It contains numerous spermatozoa near its junction with the oviduct, whence it curves round and passes to the outside through a small muscular aperture on a level with the centre of the right testis in a dorso-lateral position. Its function therefore appears to be the expulsion of surplus spermatozoa.

After receiving Laürer's canal, the oviduct bends round to the left of the ovary and there receives dorsally the common yolk duct from the vitelline glands and then widens immediately to form the ootype which is relatively large and in proportion to the large size of the ripe eggs. It is lined by a delicate cellular membrane and receives a secretion from the shell glands.

The vitelline glands consist of a number of yolk follicles 0·05 mm. in diameter arranged in the form of an arc in the anterior third of the body. In this species the arc is divided into three groups, one anterior and two antero-lateral, the anterior one being the most centrally placed. Each group contains 8–10 follicles, each of which is made up of cells which are largest towards the centre. The yolk granules inside the cell do not take up the stain and appear yellow; they escape into the ducts by the rupture of the cell. Each follicle has one small duct, and these open alternately on either side of each of the two main yolk ducts. These latter are 0·008 mm. in diameter and occupy a dorsal position throughout most of their course. The follicles to the left of the middle line drain into the left yolk duct and those to the right into the right yolk duct. The left yolk duct passes backwards right of the left testis and then transversely above the oesophagus to loop forwards again to a position dorsal to the shell gland. Here it is joined by the right yolk duct which has a much shorter course mainly dorsal to the ovary. Where the two main yolk ducts join a yolk reservoir is formed from which a short common yolk duct passes ventrally into the end of the oviduct near the ootype.

The shell gland surrounding the ootype is compact and globular with a diameter of 0·08 mm. It is composed of numerous unicellular gland cells with large nuclei and abundant cell contents opening independently into the ootype. The shell gland lies left

of the ovary and partly overlaps it postero-dorsally; it is separated from the surrounding parenchyma by a thin muscular limiting layer which probably functions to press the eggs onwards from the ootype.

From the ootype the female duct proceeds as the uterus which forms a number of coils posterior and ventral to the ovary. This part functions as a receptaculum uterinum and contains numerous spermatozoa as well as eggs. The uterus then turns directly anteriorwards as a straight tube dorsal to the digestive canal and then forms a number of loops between the intestine and the arc formed by the vitellaria. It then proceeds posteriorly ventral to the left testis as far as the cirrus sac. Here it crosses beneath the cirrus sac and runs parallel to its right border to open into the genital sinus dorsal and to the right of the aperture of the ejaculatory duct. For a distance almost equivalent to the length of the cirrus sac the walls of the uterus are especially thick and muscular with a cuticular lining and smaller cavity. This region is an ill-defined metraterm and bears at its aperture a globular sphincter which regulates the passage of eggs to the outside. The exact number of coils of the uterus varies with age, but the general course is constant for the species. The ripe eggs are relatively large and measure $0{\cdot}027 \times 0{\cdot}018$ mm. They are yellowish with one end slightly pointed and many showed signs of segmentation within the uterus.

Comments on nomenclature

Skrjabiniella aculeatus (Odhner) is a typical member of the suborder Gasterostomata. This suborder was first created by Odhner (1905) to include those digenetic trematodes with a mouth situated on the ventral surface of the body as opposed to the anterior position characteristic of the Prostomata. Amongst them are forms whose exact positions with regard to classification have long been confused. Odhner included only one family in his suborder, the family Gasterostomidae, in which he recognized two genera. Those with a sucker at the anterior end he grouped together in the genus *Gasterostomum*, while for those with a retractile rhynchus or proboscis instead of a sucker he created the new genus *Prosorhynchus*.

Nicoll (1914) divided Odhner's genus *Gasterostomum* into three new genera, *Bucephalus* Baer, *Bucephalopsis* Diesing and *Rhipidocoyle* Diesing. He stressed the fact that he had found in *Rhipidocotyle* a fan-shaped hood, which he thought might represent a vestigial or rudimentary rhynchus, as well as a small sucker. Since the creation of the genus *Prosorhynchus* rests upon the assumption that the rhynchus and the sucker are homologous and therefore not found together in any one form, a further investigation of *Rhipidocotyle* and allied types should prove useful. But so far as present information suggests there seems to be good reason to place forms possessing a rhynchus in a separate genus. In spite of *Rhipidocotyle*, Nicoll (1914) raised Odhner's two genera to subfamily rank and they become, as tentatively suggested by Odhner himself, the subfamilies Bucephalinae (=Gasterostominae) in place of *Gasterostomum* and Prosorhynchinae in place of *Prosorhynchus*.

Issaitschikow (1928) revised the suborder Gasterostomata. He accepted the subfamilies Gasterostominae and Prosorhynchinae, but pointed out another feature of subfamily importance in addition to the rhynchus or sucker, viz. the arrangement of the yolk follicles. Thus he defined the subfamily Gasterostominae as having an anterior sucker and yolk follicles in two lateral groups, and the subfamily Prosorhynchinae with anterior rhynchus and yolk follicles forming an arc anteriorly. He also redefined the genus

P.aculeatus (cont. from Jones,1943)

anterior to them. For those members of the suborder with the testes arranged symmetrically on either side of the body and a more posterior mouth he created the new genus *Skrjabiniella* with *S. aculeatus* (= *Prosorhynchus aculeatus*) as type-species.

This definition of the genus *Skrjabiniella* was accepted by Pigulewsky (1931). He revised the Prosorhynchinae again and recognized that the types included here could again be divided into two groups on the form of the yolk glands in the same way as Issaitschikow divided the subfamilies. He therefore created two tribes within the Prosorhynchinae: Prosorhynchia with oval bodies and yolk follicles in the form of an anterior arc, and Gotonia with elongated bodies and yolk follicles in two lateral groups. He therefore cancelled out the view of Issaitschikow that the arrangement of yolk follicles is a feature of subfamily rank, and so leaves Nicoll's definition of the two subfamilies as the most feasible method of classification.

Subsequent writers have not accepted this new generic name *Skrjabiniella* for *Prosorhynchus aculeatus*. Manter (1934) considered *Skrjabiniella* to be a synonym of *Prosorhynchus*, while Yamaguti (1937) regarded it as a subgenus of *Prosorhynchus*.

Table 1. *List of species of the genus* Prosorhynchus *Odhner showing subdivision into two genera*— Prosorhynchus *s.str. and* Skrjabiniella

Species	Arrangement of yolk follicles	Arrangement of testes	Shape of body	Shape of rhynchus	Position of mouth in relation to anterior testis
Prosorhynchus Ozaki Manter	Two lateral groups	In tandem	Elongated	Oval	Posterior
Prosorhynchus crucibulum (Rud.)	Anterior arc	Symmetrical	,,	Conical	Anterior
Genus *Skrjabiniella*:					
Prosorhynchus aculeatus Odhner	Anterior arc	Symmetrical	Elliptical	Oval	Posterior
Prosorhynchus squamatus Odhner	,,	,,	,,	,,	,,
Prosorhynchus uniporus Ozaki	,,	,,	,,	,,	,,
Prosorhynchus grandis Lebour	,,	,,	,,	,,	,,
Genus *Prosorhynchus* s.str.:					
Prosorhynchus facilis (Ozaki)	Two lateral groups	In tandem	Elongated	Conical	Anterior
Prosorhynchus cortai Trav. Art. & Per.	,,	,,	,,	,,	,,
Prosorhynchus platycephali (Yamaguti)	,,	,,	,,	,,	,,
Prosorhynchus Manteri Sriv.	,,	,,	,,	,,	,,
Prosorhynchus arabiana Sriv.	,,	,,	,,	,,	,,

In the present work a list has been compiled of eleven species of *Prosorhynchus* (Table 1) with their most significant points of contrast. From this table the original genus *Prosorhynchus* as defined by Odhner can be divided into two definite groups upon five characters of generic importance, viz. the arrangement of yolk follicles, position of testes relative to each other, shape of body, shape of rhynchus, and position of mouth relative to testes. Each of these characters is equally constant, and upon them all the same four species are separated from the remainder of the genus, viz. *Prosorhynchus aculeatus*, *P. squamatus*, *P. uniporus*, and *P. grandis*, although Issaitschikow did not separate out any types other than *P. aculeatus*. *P. Ozaki*, and *P. crucibulum* are the only ones which at present appear not to fit into this scheme, but since they are both inadequately described further work upon them would be essential to complete this division. Pigulewsky (1931) includes the arrangement of yolk follicles as a diagnostic feature of the tribe, while he accepts the arrangement of the testes and position of the mouth as features distinguishing the genus

Skrjabiniella. All three characters as well as shape of body and shape of rhynchus have been shown in the present survey to be of equal importance, since the genus divides itself into the same two groups on each feature. The present writer considers that at the moment we cannot assume more than the rank of genus for these characters, and the following key to the genera of the subfamily Prosorhynchinae is suggested:

Yolk follicles arranged in anterior arc, testes symmetrically arranged on either side of the body, body elliptical, rhynchus oval, mouth behind anterior testis. Genus SKRJABINIELLA

Yolk follicles arranged in two lateral groups, testes arranged in tandem, body elongated, rhynchus elongated, mouth in front of anterior testis. Genus PROSORHYNCHUS

According to the present analysis *Skrjabiniella* is a separate genus not synonymous with nor a subgenus of *Prosorhynchus*.

Prosorhynchus aculeatus Odhner, 1905

(Gast. crucibulum vanBen., 1870; Gast. armatum Olss., 1876)

Length 1.5 to 2. mm. Body apparently rather flattened, rounded at both ends, egg-shaped in outline. Maximum width 0.65 to 0.75 mm. in midbody. Rostellum a little larger than in P. squamatus but of similar structure. Skin spined. Spines thicker near anterior end. Mouth at the beginning of the last 1/3 or ¼ of the body length. Intestine short, not reaching midbody. Testes lie nearly symmetrical on each side, the anterior to the left in or a little behind midbody, the posterior to the right near the pharynx. In front of the right testis and at the same level with the left testis lies the ovary. Vitellaria extending to midbody on each side. Eggs about 26 µ. Cirrus sac and excretory vesicle over-reaching the pharynx.

Host: intestine, Conger vulgaris

Locality: Mediterranean, Belgium, Sweden.

Yamaguti (1934) records this species from Conger myriaster from Ise Bay, Inland Sea, Japan. He gives: anterior sucker 0.084 by 0.126 mm. .....vitelline follicles about 30 in number, forming an arch with the limbs extending to the level of the anterior end of the ovary. Excretory pore just behind the genital pore. He records the larvae encysted on the gills and buccal cavity of Rhinogobius sp.

P. aculeatus after VanBenden

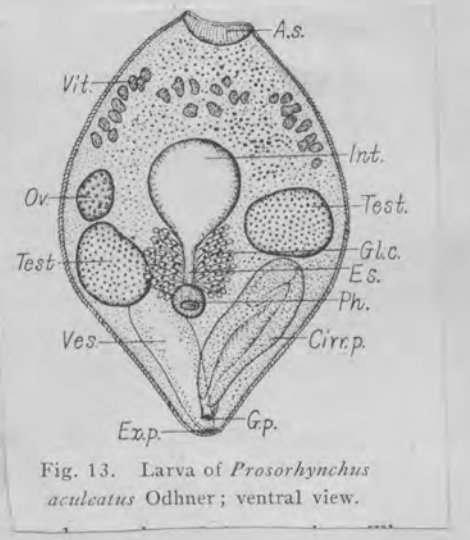
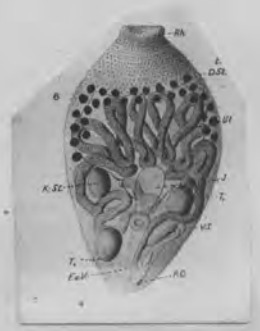


Fig. 13. Larva of *Prosorhynchus aculeatus* Odhner; ventral view.



from Nicoll, 1910

Brinkmann (1957) compares this with P. crucibulum P. squamatus

Recorded & described by Nicoll (1910) from Conger conger in the Firth of Clyde.

Carrière (1937) reports metacercariae encysted (in skin and subcutaneous musculature of Gobius minutus Pallas, G. jozo L, & Crenilabrus massa Risso. Fed to Hyla arborea L. The gasterostomes lived 5 days but did not develop. Eaten by another Gobius, the gasterostome developed but not to the point of egg production.

Prosorhynchus aguayoi n. sp. PÉREZ VIGUERAS, 1955

(Fig. No. 5)

Hospedero: *Rypticus saponaceus* (Bloch & Schn.). Nomb. vulg.: Pez jabón.

Localización: Intestinos.

Localidad: Litoral Norte de La Habana.

Descripción. — Cuerpo alargado, más ancho en su parte ecuatorial, atenuado en ambos extremos, tegumento recubierto de numerosas y pequeñas espinas, mide alrededor de 1.7 mm. de largo por unos 0.5 mm. de diámetro transversal máximo. *rhynchus* pequeño, cónico, de 154 micras de largo por 126 micras de ancho máximo, abertura bucal ligeramente pre-ecuatorial y en la línea media ventral, pharynx muy pequeña y poco desarrollada, intestino sacciforme y anterior a la abertura bucal. Gonados en *tandem*, en posición diagonal al eje longitudinal del cuerpo, testículos ligeramente ovalados, lisos, ecuatoriales, contiguos, de casi igual forma y tamaño entre sí, mide cada uno 125 por 113 micras, el *ovarium* es pre-ecuatorial, pre-testicular, liso, es derecho a la línea media, ligeramente ovalado, mide aproximadamente 135 por 120 micras en sus diámetros. Folículos vitelinos ligeramente ovalados, pre-testiculares, dispuestos lateralmente en filas de uno, dos y tres y formando un arco anterior, se cuentan unos 18 a cada lado y tres o cuatro anteriores, cada folículo mide cerca de 40 por 52 micras en sus diámetros. Saco del *cirrus* izquierdo ,bien desarrollado, cilíndrico, de 370 micras de largo por 115 micras de diámetro transversal, situado en el tercio posterior del cuerpo, vesícula seminal tubular, de 110 micras de largo, poro genital a 260 micras del extremo caudal, poro excretor terminal. *Uterus* bien desarrollado, en numerosas asas, extendiéndose desde cerca del extremo caudal hasta los folículos vitelinos más anteriores, a cerca de unas 300 micras del extremo anterior del cuerpo. Huevos elípticos, de color castaño-claro, operculados, de cáscara gruesa, muy numerosos, cada uno mide 40 por 26 micras.

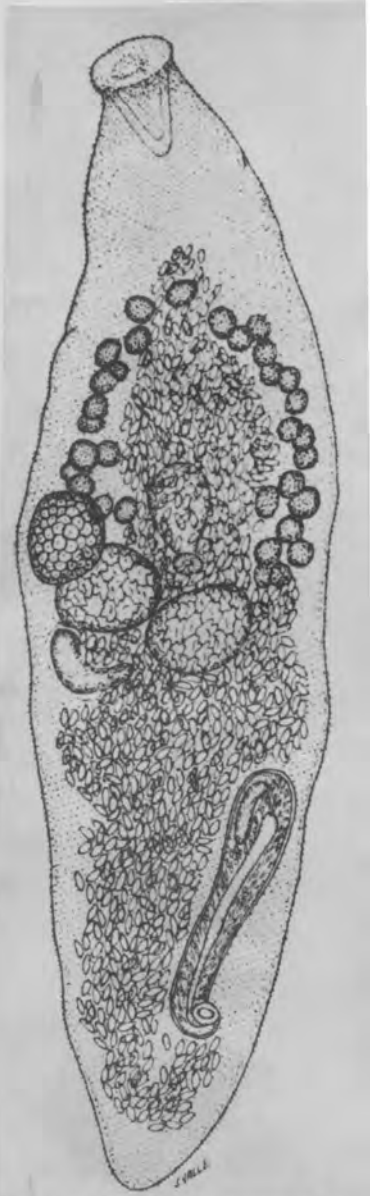


Fig. 5. — *Prosorhynchus aguayoi* n. sp. de *Rypticus saponaceus*

Prosorhynchus aguayoi Pérez Vigueras, 1955

Host: Rypticus saponaceus (C, J).

Site: intestine.

Deposited specimen: U.S.N.M. 60253.

Eggs from the Curaçao material tend to be shorter and wider (38-43 by 24-27 μ) than those from Jamaica (40-46 by 21-26) but their measurements overlap. Pérez Vigueras gave an average egg size of 40 by 26.

Nahhas & Cable, 1964

CURAÇAO + JAMAICA

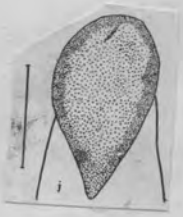
Host family Epinephelidae (groupers)

P. facilis

Prosorhynchus apertus McFarlane, 1936

Body 1.4 to 2.07 by 0.22 to 0.36.
Pharynx in middle of body, 0.04 in diameter.
Intestine sac-shaped with cellular projections into lumen.
About 30 vitelline follicles in two rows, becoming confluent in region of anterior portion of uterus.
Excretory pore terminal.
Ovary anterior to testes.
Uterus in longitudinal folds. Eggs 23 to 26 by 11 to 13 μ.
Testes oblique or tandem, in posterior part of body.
Cirrus sac 0.2 to 0.31 by 0.078 to 0.091.
Seminal vesicle an ovaoid sac in anterior portion of cirrus sac.
Genital pore subtermnial on ventral surface.
Host: Ophiodon elongatus Girard...ling cod
Locality: British Columbia.

Compared with P.facilis. Differs in measurements and in the shape of the seminal vesicle which is a sac rather than a winding tube.



Synonym of P. facilis according to Nagaty, 1937.

perhaps probably

Prosorhynchus arabiana Srivastava,1938

Body cylindrical, 3.3 to 4.5 by 0.4 to 0.6
Rhynchus baloon shaped, 0.22 to 0.3 by 0.16
Pharynx 0.06 to 0.08, 3/5 from anterior end, to left.
Intestine 0.16 to 0.24 by 0.12 to 0.15
Testes tandem, posterior testis in front of posterior 1/5
Cirrus sac small,narrow,club-shaped, 0.4 to 0.26 (?) by 0.06 to 0.08/
Ovary immediately pretesticular.
Vitellaria lateral, in pairs fro level of posterior margin of ovary to pharynx.
Uterus from anterior 2/5.
Eggs 23 by 12 µ
Excretory bladder from pharynx to excretory pore.
Host: Synaptura orientalis Bloch
Locality: Arabian Sea
Reference: Indian Jour.Vet.Sci., 8:317-340.

Fig. 10.
Prosorhynchus arabiana n. sp.

-OVER-

Prosorhynchus arabiana Srivastava, 1938

Only four specimens, all mature, of this species were recovered from the intestine of its host examined at Karachi in June 1936. The elongated, cylindrical body in permanent mounts measures 3·3 – 4·5 in length and 0·4 – 0·6 in maximum breadth which occurs at the level of ovary. The cuticle has extremely fine spines which are hardly visible *in toto* mounts. At the anterior end of the body is a baloon-shaped rhynchus of 0·22 – 0·3 × 0·16 in size. The small, globular pharynx of 0·06 – 0·08 in diameter is situated to the left of the

median line at about three-fifths of body length from the anterior end. It is followed by a small oesophagus which opens into the bulb-shaped intestine, 0·16 – 0·24 × 0·12 – 0·15 in size.

The testes are in tandem. The posterior testis of 0·1 – 0·12 × 0·08 – 0·12 in size lies in the median line in front of the hinder fifth of the body length. The anterior testis measures 0·1 – 0·12 in diameter and lies close in front of the posterior one. The small, narrow, club-shaped cirrus sac of 0·4 – 0·26 × 0·06 – 0·08 in size lies along the right body wall, extending forward upto the middle of the hinder testis. It encloses a small vesicula seminalis, 0·08 – 0·12 × 0·04 – 0·06, an elongated, narrow pars prostatica, 0·14 – 0·22 × 0·04 – 0·06, surrounded by prostate glands, and a minute ductus ejaculatorius. The small genital tongue is hook-shaped. The genital sinus opens a little in front of the hinder end on the ventral surface of the body.

The small, ovoid ovary 0·08 – 0·12 in diameter, lies immediately in front of the anterior testis. The shell gland complex lies in the space between the ovary, anterior testis and the left body wall. A small Laurer's canal is present. The vitellaria consisting of small, pear-shaped follicles and arranged longitudinally in pairs on either side of body extend from the level of the posterior margin of ovary to the level of the pharynx. The uterus contains a fairly large number of eggs and extends from the anterior two-fifths of the body length to the genital tongue. The eggs measure 0·023 × 0·012 in size.

The excretory bladder is a small, elongated, saccular tube extending from the level of pharynx to the excretory pore which is situated near the genital opening.

In having a cylindrical body and the testes arranged in tandem *P. arabiana* resembles the species with which the preceding species has been compared. However, it differs from all of them in the position of its pharynx, intestine, gonads and of the vitellaria, and in the extent of uterus and the characteristic shape of the rhynchus, besides differences in measurements.

from Indian J. Vet. Sci. 8: 336-338

Prosorhynchus atlanticus, n. sp. Manter, 1940

(Figures 18, 19)

Synonyms. *Gasterostomum* sp. Linton, 1910, p. 79, from *Mycteroperca bonaci*

Gasterostomum sp. Linton, 1910, p. 80, from *Mycteroperca venenosa*

Hosts. *Mycteroperca bonaci* (Poey), type host

M. microlepis (Goode & Bean)

M. venenosa (Linn.)

Location. Usually in the ceca; sometimes in the stomach; sometimes in the intestine

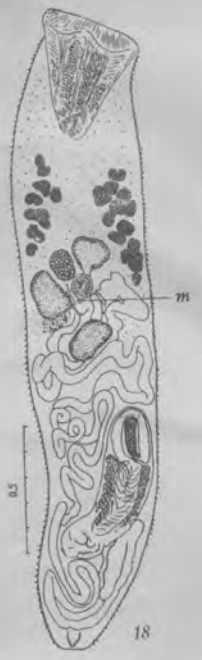
Frequency. Present in 2 of 5 *M. bonaci*; in 1 of 1 *M. microlepis*; in 1 of 5 *M. venenosa*

Diagnosis (based on about 20 specimens). Length 0.705 to 1.677; width 0.200 to 0.300. Anterior end truncate; posterior end tapering and somewnat pointed. Rhynchus large, muscular, cone-shaped; 0.172 to 0.277 long by 0.125 to 0.210 wide. Mouth slightly anterior to midbody in all specimens collected. Pharynx 0.042 to 0.059 in diameter; intestine short, saclike, extending forward. Gonads tandem or slightly diagonal, more or less to the right of midline, about at midbody level, near pharynx. Ovary pretesticular, globular, to right of pharynx. Vitelline follicles large, arranged in two separated lateral groups extending from about pharynx level halfway to anterior end of body; 11 to 16 follicles on each side. Yolk ducts uniting between testes. Uterus almost never extending anterior to ovary (slightly so in 1 of 29 specimens) and always extending posterior to genital pore. Eggs ovoid, thick-shelled, brown, 27 to 34 by 14 to 22 microns; average about 30 by 17 microns.

Testes ovoid, tandem or diagonal (usually diagonal), usually slightly separated. Cirrus sac well developed but usually not extending to posterior testis, only rarely (in young specimens) extending anterior to posterior testis, with tubular, coiled seminal vesicle. Genital pore ventral, a short distance anterior to posterior end of body. Excretory pore terminal, vesicle reaching to level of pharynx.

The name *atlanticus* is for the locality.

Comparisons. *Prosorhynchus atlanticus* is most similar to *P. pacificus* Manter, 1940, collected from related hosts in the tropical Pacific. It differs in larger egg size (27 to 34 by 14 to 22 microns as compared with 24 to 27 by 12 to 17 microns), and the eggshell definitely tends to be thicker and darker in color. These differences might be considered subspecific by some. As in the case of *P. pacificus*, the large size of the rhynchus, the separated vitelline follicles, and the postovarian uterus distinguish *P. atlanticus* from other species.



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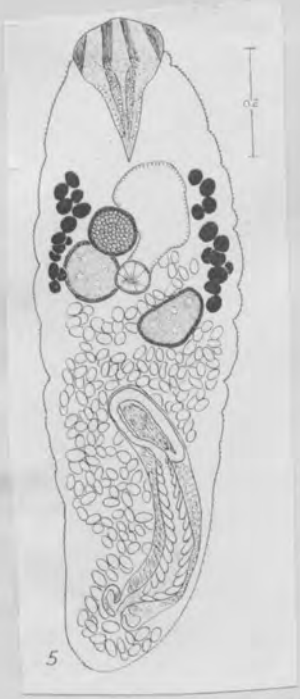
19

Considered a synonym of P. atlanticus by Hanson, 1950

Prosorhynchus atlanticum Manter, 1940**
Synonym: *Gasterostomum* sp. Linton, 1910
Host: *Mycteroperca bonaci*
Site: intestine
Locality: Alligator Harbor
A single specimen was found; eggs measured 32-35 by 21-23 microns.

APALACHEE BAY, GULF OF MEXICO
FROM NAHHAS AND SHORT (1965)



From Siddiqi & Cable, 1960

Prosorhynchus atlanticum Manter, 1940
Synonyms: *Gasterostomum* sp. Linton, 1910 from *M. bonaci*; *Gasterostomum* sp. Linton, 1910 from *M. venonosa*.
Hosts: *Mycteroperca bonaci* (C, J); **M. falcata* (C); *M. venonosa* (C).
Site: ceca and intestine.
Manter (1940c) distinguished this species from *P. pacificum* by the larger eggs with thicker and darker shells. Hanson (1950) was of the opinion that the 2 overlapped in that respect and synonymized them. *P. pacificum* has eggs 24-27 by 12-17 whereas they measure 29-36 by 18-24 in our specimens and 31-36 by 21-24 in those of Siddiqi and Cable (unpublished data). We regard that difference as being of specific magnitude.

CURAÇAO + JAMAICA; FROM NAHHAS + CABLE, 1964

Prosorhynchus attenuatus Siddiqi & Cable,1960

Description based on 29 specimens with characters of the genus. Body slender, about equally wide throughout except at rounded ends, 0.693 to 1.107 long, 0.138 to 0.184 wide. Cuticel with spines becoming less numerous posteriorly. Rhynchus spherical, sucker-like, muscular, 0.090 to

0.105 in diameter. Mouth submedian, posterior to midlevel; pharynx spherical, 0.033 to 0.045 in diameter; intestine saclike, dorsal to pharynx. Gonads to right of midline; testes 2, entire, 0.051 to 0.070 by 0.060 to 0.075, tandem, postovarian, anterior testis contiguous with intestine, sometimes overlapping ovary. Cirrus sac elongate, extending to level of posterior testis, containing small saclike seminal vesicle, tubular pars prostatica and prostate cells. Genital pore ventral, near posterior end of body. Ovary entire, 0.060 to 0.075 by 0.046 to 0.066, pretesticular, overlapping pharynx. Vitellaria in anterior half of body, in 2 lateral groups of diffuse follicles in linear arrangement. Uterus extends from posterior end of body to anterior limit of vitellaria. Eggs numerous, 0.019 to 0.021 by 0.013 to 0.015. Excretory vesicle tubular, extending well anterior to vitellaria; excretory pore terminal.

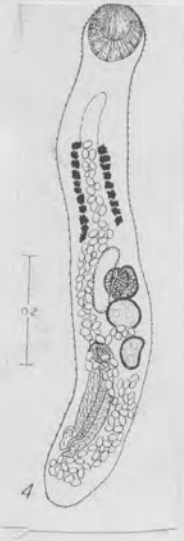
Host: *Chloroscombrus chrysurus*.

Site: intestine.

Locality: Playa Mani, P. R.

Type specimen: Holotype No. 39303.

This species is similar to *Prosorhynchus tsengi* Tsin, 1933 (= *Gotonius platycephali* = *Prosorhynchus platycephali* Yamaguti, 1934) but differs from that species in smaller size, shape of the rhynchus, topography of gonads, extent of cirrus sac, and much smaller eggs.



SZIDAT, 1961

2. *Prosorhynchus australis* n. sp. Abb. 19 a—c). H. W. MANTER (1942) beschreibt aus *Mycteroperca bonaci* und anderen Arten dieser Gattung vom Nordatlantik und bei den Tortugas-Inseln *Prosorhynchus atlanticus*. Diese Art hat größte Ähnlichkeit mit *Prosorhynchus pacificus* aus verwandten Wirtsfischen des Pazifik jenseits der Landenge von Panama und bildet nach MANTER ein schönes Beispiel für die zweifellos noch im Miozän vorhandene Verbindung der beiden, später durch das Auftauchen der Landenge getrennten Teile der Tethys (S. EKMAN, 1935).

Die von mir in *Urophycis brasiliensis* gefundene Art hat wiederum große Ähnlichkeit mit *Prosorhynchus atlanticus* MANTER des Nordatlantik, nur läuft der Rhynchus spitzer zu und ist merklich länger, auch vereinigen sich die Dotterstock-Follikelreihen beider Seiten hufeisenförmig an ihrem vorderen Ende, und die Hoden sind viel größer als das Ovarium. Im übrigen sind jedoch die Körper- und Eimaße gleich denen von *Prosorhynchus atlanticus*.

Der Körper der neuen Art ist 0,75—1,2 mm lang und 0,3—0,35 mm breit, wobei auf den auffallend langen und spitzen Rhynchus 0,2—0,25 mm in der Länge fallen. Der kräftig ausgebildete Pharynx (Bauchsaugnapf) mißt 0,06 mm im Durchmesser. Der Darmsack ist von der Pharynxöffnung nach vorn zu verlagert. Die sehr großen Hoden liegen je nach dem Streckungszustand in einer Linie hintereinander oder schräg nebeneinander. Sie sind stets etwa doppelt so groß wie das kugelige Ovarium. Die Dotterstöcke liegen mit je etwa 11—13 großen Follikeln vor dem Ovarium und vereinigen sich am Vorderende ähnlich wie bei *Bucephalus urophyci* n. sp. Der lange Zirrusbeutel reicht stets bis zur Mitte des hinteren Hodens. Die Uterusschlingen reichen nach vorn zu meist über das Ovarium hinweg, aber nicht über die Dotterstocksfollikel hinaus.

Die reifen Eier haben eine dunkelbraune dicke Schale und messen 0,025 bis 0,029 mm in der Länge und 0,017—0,02 mm in der Breite.

Prosorhynchus australis n. sp. kommt, wenig zahlreich, im Magen, den Appendices pyloricae und im Vorderdarm von *Urophycis brasiliensis* auf den Muschelbänken vor der Küste Argentiniens in Höhe von Puerto Quequén vor. (Nach neueren Untersuchungen an Plattfischen [s. weiter unten] scheint die eingekapselte Larve auf den Kiemenbögen von *Oncopterus darwini* zu leben [?], wovon kleine Exemplare evtl. durch *Urophycis brasiliensis* verzehrt werden. Da die Hauptmasse der eingekapselten Würmer jedoch erst bei großen Exemplaren von *Oncopterus darwini* anzutreffen ist, kommt vielleicht noch ein anderer, größerer Raubfisch als Endwirt für *Prosorhynchus australis* in Frage.

Abb. 19 a—c. *Prosorhynchus australis* n. sp. aus dem Magen von *Urophycis brasiliensis* von den Muschelbänken vor Puerto Quequén.

SEE SZIDAT (1963) - cercaria.

transferred to Bucephalus by Yamaguti 1971

Prosorhynchus bulbosus Kohn, 1961

(Est. 4, figs. 9-13; est. 5, figs. 14-16)

Prosorhynchus bulbosus Kohn, 1961: 46-48

Trematódeos com o corpo alongado, com extremidades arredondadas; medem 2,90 a 6,28 mm de comprimento por 0,47 a 0,98 mm de largura. Cutícula lisa. Extremidade anterior com *rhynchus* bem desenvolvido, com 0,41 a 0,86 mm de comprimento por 0,35 a 0,60 mm de maior largura; é constituído de uma porção anterior mais larga, com algumas fibras musculares longitudinais e uma porção posterior alongada apresentando quatro formações longitudinais de contôrno irregular. Bôca simples, ventral, situada no têrço médio do corpo. Faringe muscular presente, com 0,070 a 0,170 mm de comprimento por 0,080 a 0,150 mm de largura. Esôfago com 0,06 a 0,18 mm de comprimento.

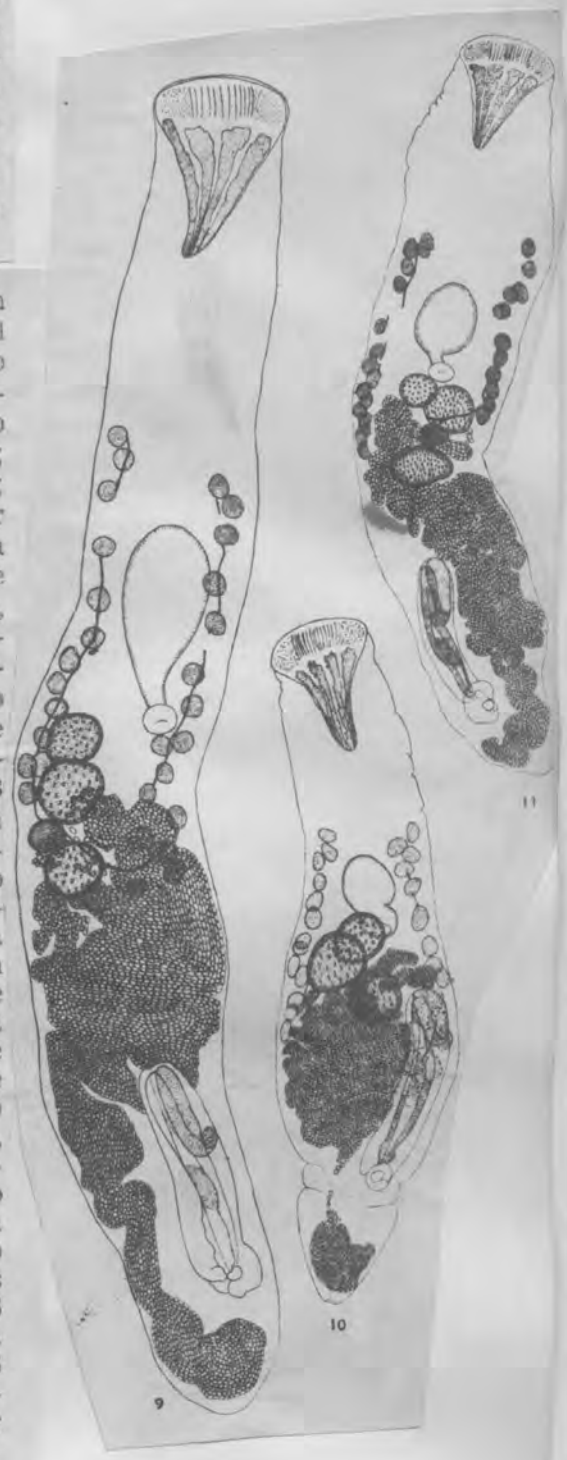
Ceco intestinal com 0,41 a 0,93 mm de comprimento por 0,19 a 0,39 mm de maior largura, dirigido da abertura bucal para diante. Átrio genital ventral, bem desenvolvido, situado próximo à extremidade posterior do corpo. Poro genital masculino com uma papila genital dorsal, em forma de lingüeta, e outra papila ventral de forma irregular. Bôlsa do cirro bem desenvolvida, alongada, dirigida do poro genital para diante; mede 0,71 a 1,18 mm de comprimento por 0,19 a 0,33 mm de largura; encerra vesícula seminal, que se curva em U de convexidade posterior ao nível do têrço proximal da bôlsa do cirro, ligando-se pouco depois a um canal prostático que é cercado de numerosas células prostáticas, e que se curva em U de convexidade anterior, no fundo da bôlsa do cirro, dirigindo-se para trás e terminando no poro genital, em um bulbo copulador (ventosa genital) que mede 0,045 a 0,075 mm de diâmetro. Testículos de contôrno liso, mais ou menos arredondados, no mesmo campo ou com campos parcialmente coincidentes; têm zonas parcialmente coincidentes ou um pouco afastadas, são pós-faringeanos e pós-ovarianos. O testículo anterior mede 0,14 a 0,37 mm de comprimento por 0,18 a 0,30 mm de largura; o posterior mede 0,19 a 0,41 mm por 0,19 a 0,31 mm. Ovário de contôrno liso, mais ou menos arredondado, pré-testicular e pós-faringeano; fica totalmente ou em parte no campo testicular; sua zona é parcialmente coincidente com a do testículo anterior, cuja área pode invadir; às vêzes invade, em parte, a área e a zona da faringe; mede 0,13 a 0,26 mm de comprimento por 0,13 a 0,24 mm de largura. Oviduto dirigido do ovário para a glândula de Mehlis, que é bem desenvolvida, situada na região inter-testicular, e mede 0,11 a 0,15 mm de comprimento por 0,11 a 0,14 mm de largura. Canal de Laurer não evidenciado. Útero dirigindo-se da região da glândula de Mehlis para a zona testicular anterior e depois para trás, formando numerosas sinuosidades que enchem tôda a área pós-testicular do corpo, localizando-se ao lado da bôlsa do cirro e estendendo-se até a extremidade posterior do corpo. Ovos pardacentos, de casca lisa, com opérculo achatado; medem 0,028 a 0,034 mm de comprimento por 0,019 a 0,025 mm de largura. Vitelodutos nítidos, confluindo ao nível da porção anterior da glândula de Mehlis. Vitelinos constituídos por folículos arredondados, que medem 0,054 a 0,110 mm de comprimento por 0,056 a 0,093 mm de largura; são situados lateralmente, estendendo-se da zona pré-cecal até a zona testicular posterior; seu número varia de 11 a 16 de um lado e de 13 a 16 do outro. Poro genital feminino simples abrindo-se no átrio genital, um pouco atrás do poro masculino. Poro excretor terminal. Vesícula excretora tubular, porém não estudada com detalhe.

Habitat — Intestino delgado de *Garrupa* sp.

Proveniência — Baía de Guanabara, Rio de Janeiro, Estado da Guanabara, Brasil.

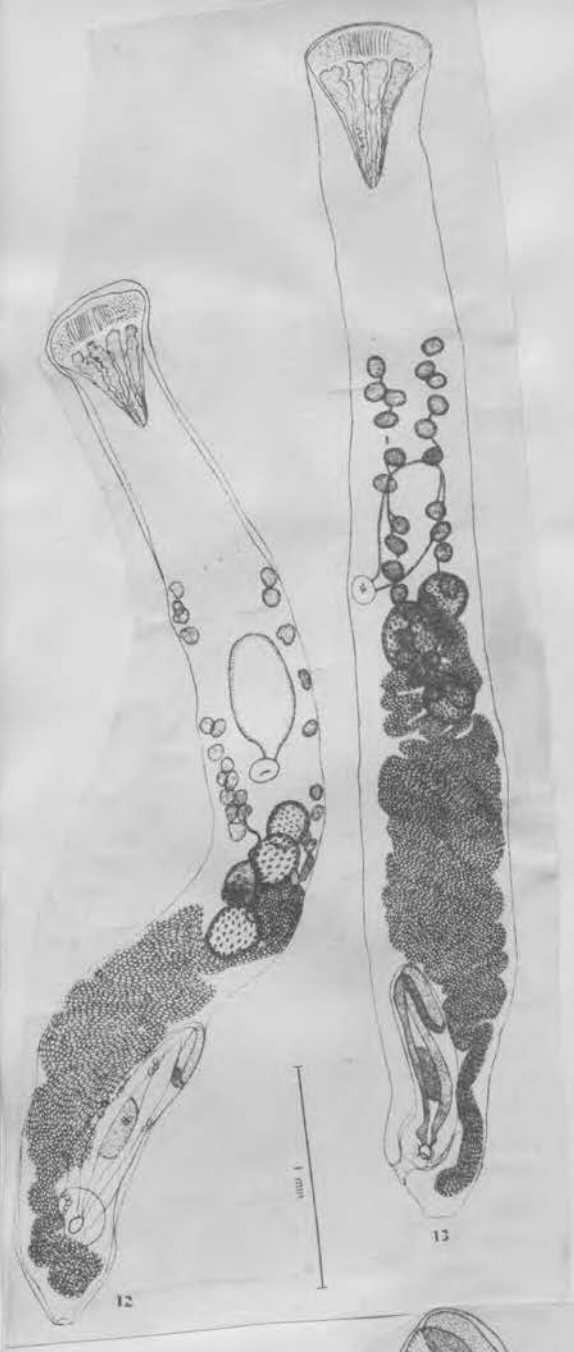
Tipo n.º 28 739a e parátipos ns. 28 739b-ba depositados na Coleção Helmintológica do Instituto Oswaldo Cruz.

No Quadro III damos as principais medidas de alguns espécimes.



FROM KOHN, 1967

see reprint for table of measurements of individual specimens



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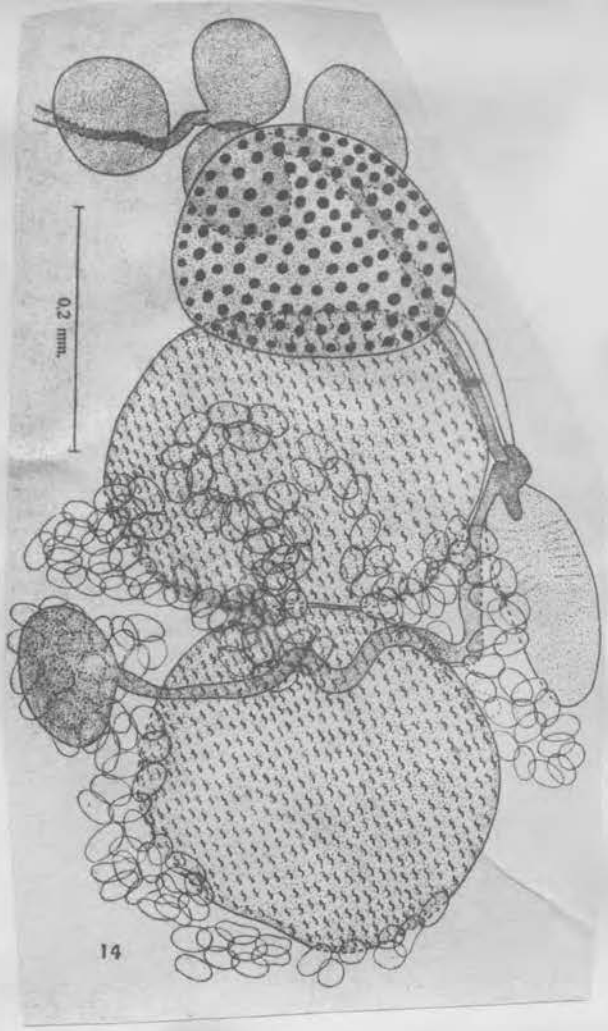

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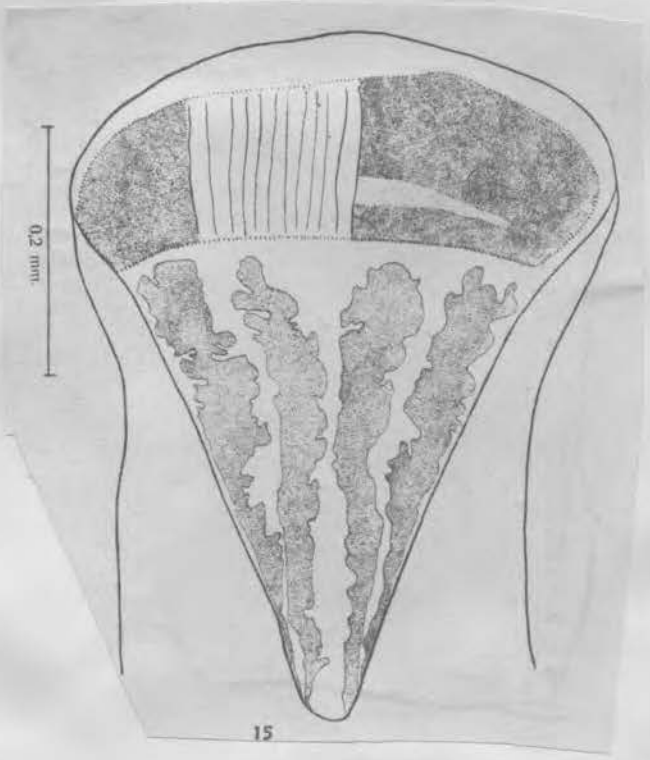

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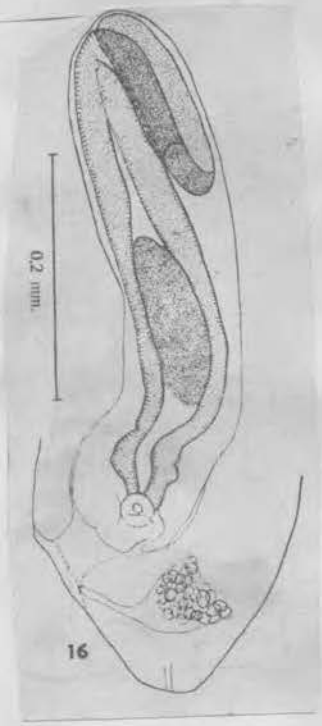

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Prosorhynchus bulbosus Kohn, 1961

No figure given.

Host: Garrupa sp.
Loc.: Intestine
Baia de Guanabara, Rio de Janeiro, Estado da Guanabara, Brasil

see reprint for description
no fig.

body length: 2.90 to 6.28 mm
body width: 0.47 to 0.90 mm
Rhynchus length: 0.41 to 0.86 mm.
Rhynchus width: 0.36 to 0.60 mm.
Pharynx: 0.07 to 0.015 long (mm) X 0.090 to 0.015 mm wide
Intestine 0.41 to 0.93 mm long X 0.19 to 0.37 mm wide
Cirrus pouch: 0.71 to 1.12 mm long X 0.19 to 0.31 mm wide
Eggs 0.030 to 0.034 mm long X 0.019 to 0.021 mm wide
Vitellaria extend from preccal zone posterior to testicular zone. lateral 11-16 on one side 13-16 on the other.

Prosorhynchus caudovatus Manter, 1940
Syn: the P. crucibulus of Eckmann, 1932

Prosorhynchus crucibulus (Rudolphi, 1819) (Abb. 1 a–d).

Synonyma: (?) *Gasterostomum armatum* Molin, 1859,
Gasterostomum crucibulum (Rudolphi, 1819) (nec van Beneden, 1870).
Monostomum crucibulum Rudolphi, 1819,
Prosorhynchus squamatus Odhner, 1905,
(?) *Bucephalus crux* Levinsen, 1881.
Nec: *Prosorhynchus crucibulus* Manter, 1931.

Diese Art wurde von uns in den pylorischen Fortsätzen von *Epinephelus* sp., die wahrscheinlich aus Suez stammten, gefunden. Von 20 untersuchten Fischen waren sämtliche außer einem einzigen von diesen Würmern befallen. In jedem Fisch befanden sich in den meisten Fällen mehrere Exemplare des Parasiten verschiedener Größe und Alters.

Die frisch entnommenen Würmer sind sehr beweglich, wobei sich an verschiedenen Stellen ihres Körpers schmale Einschnürungen bilden, die sie in zwei Abschnitte teilen. Die im Wasser abgestorbenen Würmer nehmen eine spindelartige Form an, wobei der Vorderteil gewöhnlich etwas breiter ist als der Hinterteil. Die Länge der Würmer, die Eier enthalten, beträgt 2–4,0 mm, ihre Breite 0,4–0,7 mm. Die Minimallänge der jüngsten, unreifen Exemplare beträgt 0,5 mm.

Der ganze Körper ist mit kleinen Schuppen bekleidet. Vorn am Körper befindet sich der Rhynchus, der mit einem kegelartig sich verengenden Ende in den Körper eindringt und nach außen in Form eines rundlichen, flachen Gebildes hervorragt, das oft durch eine dorsoventrale Vertiefung in zwei unscharf getrennte Lappen geteilt ist. Den auf Abb. 6 und 7 bei Ozaki dargestellten fünflappigen Rhynchus bekamen wir selten zu sehen. Der Pharynx befindet sich im zweiten Viertel des Körpers, er ist rund und sein Durchmesser beträgt 0,10–0,15 mm. Von ihm geht ein kurzer Ösophagus aus, der in einen ovalen Darm von 0,2 bis 0,5 mm Länge übergeht, und der gewöhnlich nicht über die Grenzen des zweiten Körperviertels hinausgeht. Die Geschlechtsdrüsen variieren außerordentlich in Bezug auf ihre gegenseitige Gruppierung. Die Hoden sind ganzrandig, rundlich, oft von ungleicher Größe und betragen 0,15 bis 0,30 mm im Durchmesser; sie liegen ungefähr in der Nähe der Körpermitte, meistens einander schräg gegenüber; sie können aneinander liegen oder aber durch einen Zwischenraum getrennt sein, der dem Durchmesser

eines von ihnen gleichkommt. Der Cirrusbeutel liegt in der Nähe des Hinterkörpers. Er hat eine längliche Form und seine Länge beträgt $^1/_4$—$^1/_3$ der Körperlänge. Bei manchen Exemplaren reicht er fast bis

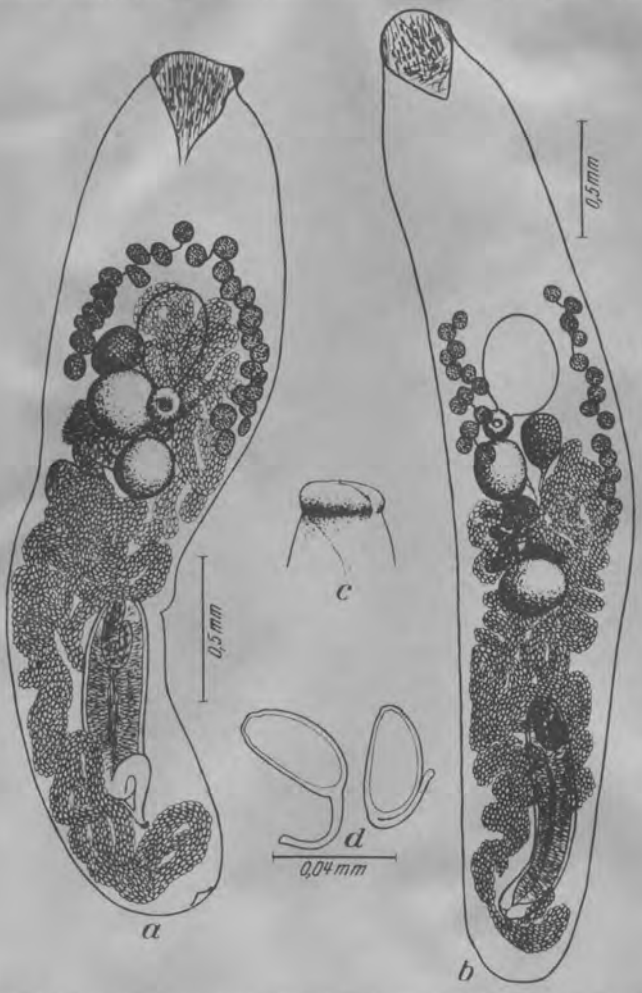


Abb. 1. *Prosorhynchus crucibulus*, nach dem Material aus Suez (oder Jaffa). a—b: Totalansicht von Exemplaren mit verschiedenartig gelagerten Genitaldrüsen. c: Vorderende des Körpers. d: Eier.

zum hinteren Hoden, bei anderen ist er von diesem durch einen Zwischenraum getrennt, der der Hälfte seiner Länge entsprechen kann. Der Cirrusbeutel enthält an seinem Vorderende eine spiralförmig gewundene Vesicula seminalis; fast sein ganzer Hohlraum ist von Prostatadrüsen ausgefüllt. Der Cirrusbeutel mündet in den Genitalsinus, der sich in

Eggs 39-45 by 19-22 μ

from: Fischthal & Thomas, 1968

Prosorhynchus caudovatus Manter, 1940 (Figs. 5a–c)

SYNONYM: *Prosorhynchus crucibulus* of Eckmann, 1932, nec Rudolphi, 1819.

HOSTS: *Epinephelus goreensis* (Cuvier and Valenciennes), sea perch or grouper (Serranidae); *Lutjanus maltzani* (Steindachner), snapper (Lutjanidae).

HABITATS: Small intestine, stomach.

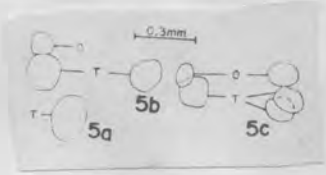
LOCALITY: Tema, Ghana.

DATE: 18 December 1964.

SPECIMENS: USNM Helm. Coll. No. 63336 (from *Epinephelus*); No. 63337 (*Lutjanus*).

MEASUREMENTS AND SOME PERTINENT DATA (based on two specimens from *E. goreensis*, and four from *L. maltzani*; five measured): Body 1,715–2,245 by 465–675, entirely spined; rhynchus 285–330 by 205–245, wedge- to funnel-shaped; pharynx 77–100 by 95–120, wider than long; narrow esophagus may be present; intestine 222–435 by 125–170; testes 167–232 by 150–196, their position in relation to each other and to ovary showing considerable variation as illustrated in Figs. 5a–c; cirrus sac 655–760 by 143–170, thick-walled, muscular, may overlap posterior testis or may be entirely posttesticular; genital atrium 186–300 by 167–200; ovary 124–198 by 111–155, overlapping testis dorsally; ootype complex dorsal to testis; Laurer's canal extending posteriorly beyond testis to dorsal surface of body; sperm in proximal part of uterus, uterine coils may extend previtellarian; vitelline follicles in five specimens numbering (right–left) 8–12, 11–13, 11–14, 12–14, 14–14, usually in separate lateral fields, forming inverted U in two; vitelline reservoir small; eggs thick-shelled, operculate, yellow to yellow-brown, 20 measuring 32–43 by 21–25, usually with anopercular filament which may be up to 30 long, some with anopercular knob only; some abnormally shaped eggs present in all specimens.

DISCUSSION: This species was originally described from *Epinephelus* sp. from the Suez. The extreme variation in the relative positions of the gonads raises some question regarding the assignment of some species to the genus *Neidhartia* Nagaty, 1937, as they are based on only one or a very few specimens. Had we encountered our specimen illustrated in Figure 5b by itself, we probably would have described it as a new species of *Neidhartia* rather than recognizing it as a variant of *Prosorhynchus caudovatus*. An anopercular process has been described for at least some of the eggs in several species of bucephalids: *Paurorhynchus hiodontis* Dickerman, 1954, possesses a "knob", *Bucephalus kathetostomae* (Manter, 1934) Manter, 1940, an "irregularly shaped cap"; *Bucephalus fragilis* Velasquez, 1959, a "protuberance."



Komiya & Tajimi, 1941

b) *Prosorhynchus chasmoechinatus* n. sp. (metacercaria). The size and structures of the body are almost the same as in the former. The only difference is that the three rows of particular spines around the base of the rhynchus are interrupted at its dorsal part.

Compared with P.echinatus.

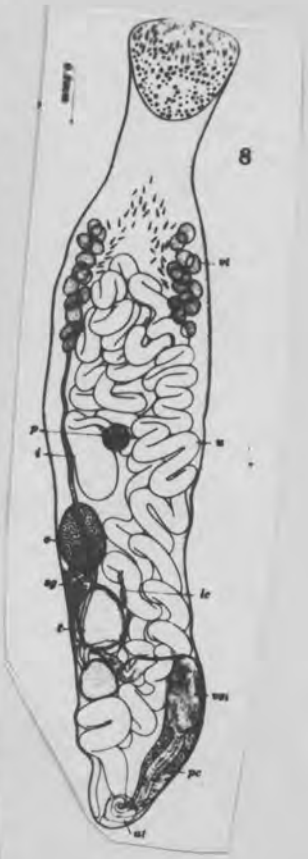
Not figured

4. *Prosorhynchus chorinemi* n. sp. Yamaguti, 1952
Pl. II, Fig. 8.

Habitat. Small intestine of *Chorinemus moadetta* (Cuv. et Valenc.).

Material and locality. A single whole mount; Macassar.

Body rod-shaped, 3.3×0.625 mm. Cuticular spines lacking, probably owing to postmortem maceration. Strong dorsoventral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muscle bundles grouped in form of an inverted V in front of anterior end of uterus. Rhynchus in form of a short plug, 0.41 mm long by 0.45 mm broad at flattened anterior end where the muscle fibers are disposed irregularly; its rounded posterior portion occupied by powerful dorsoventral muscle bundles. Pharynx globular, 0.1 mm in diameter, situated just behind midbody. Esophagus cylindrical, slightly curved, about 0.15 mm long by 35 μ broad. Intestine approximately elliptical, 0.375×0.175 mm, situated longitudinally in front of ovary. Testes oval, situated on the right about midway between pharynx and posterior extremity, separated one from the other by two loops of initial portion of uterus. Vas deferens running transversely toward anterior end of cirrus pouch, crossing ascending and descending uterus ventrally. Cirrus pouch elongate elliptical, 0.66×0.135 mm, with a very thin, apparently membranous wall, extending along left side a little further forward than middle of posterior third of body. Vesicula seminalis elliptical, 0.31×0.13 mm. Genital lobe rolled up as usual, provided dorsally with a small oval accessory lobe 27 μ long by 36 μ broad. Genital atrium about 0.1 mm in diameter, with a delicate membranous wall covered all over with a dense layer of glandular cells, opening ventroterminally by a short wide passage. Ovary oval, 0.26×0.19 mm, situated on the right between intestine and anterior testis. The germiduct, arising from the dorsal side of the ovary near its posterior end, forms a bulbous swelling 27 μ wide and then gives off the Laurer's canal about midway between the ovary and the anterior testis, where it turns to the right to receive the common vitelline duct. Laurer's canal running obliquely backward in a somewhat undulating course and turning forward acutely close to left margin of anterior testis, opening outside on middorsal line at level of posterior end of ovary. Ascending uterus turning backward in vitellarian zone. Eggs elliptical, thin-shelled, 18×11 – 12 μ in mounted condition. Vitelline follicles divided into two lateral longitudinal groups of about a dozen each about midway between anterior extremity and ovary. Excretory pore terminal; excretory vesicle tubular, wide, apparently reaching to midbody.

This species differs from any of the known members of the genus in the disposition of the digestive and reproductive organs. In these respects it rather resembles *Rhipidocotyle pentagonum* (Ozaki, 1924) but differs from this fundamentally in the structure of the rhynchus. That the Laurer's canal turns forward instead of taking a usual straight backward course is worth noting.

? Rhipidocotyle chorinemi (Yamaguti, 1952) ?

Ex. Chorinemus tala
Loc. India
From ZHUKOV, 19?? see reprint

14. *Prosorhynchus congeri* ~~n. sp.~~ Yam., 1970
(Fig. 14)

HABITAT: Intestine of *Conger* sp. (*oligoporus*?); Hawaii.
HOLOTYPE: U. S. Nat. Mus. Helm. Coll., No. 63540.
DESCRIPTION (based on nine whole mounts): Body approximately fusiform, 1.1-1.9 mm long, up to 0.46-0.97 mm wide in midregion. Cuticle finely spinose all over. Rhynchus globular, 70-100 × 70-120 μ, at posterior end of middle third of body. Intestine saccular, 0.12-0.22 mm in diameter, directed forward beyond equator.

Testes subglobular, 0.11-0.3 × 0.1-0.18 mm, one on each side of body at level of intestine. Cirrus pouch subcylindrical, 0.11-0.22 mm wide, about 0.5 mm long in the type, with thick wall of oblique muscle fibers, situated obliquely with its base to left of median line, reaching to equatorial level or not, containing curved seminal vesicle 0.06-0.14 mm wide at base; pars prostatica consisting of straight cylindrical distal portion and a narrower sigmoid proximal portion turning back on itself on anterior end of distal portion; genital lobe terminating in three short digitiform processes. Genital atrium 0.15 mm wide, constricted posteriorly. Genital pore ventroterminal.

Ovary oval, 0.13-0.2 × 0.11-0.2 mm, situated anterolateral to right testis. Laurer's canal opening dorsally to right of pharynx. Uterine coils largely confined to postvitellarian region, not extending forward beyond vitellarian zone. Eggs oval, 25-28 × 14-19 μ. Vitelline follicles 18-28 in total number, extending transversely across body at about one-third of body length from anterior extremity; collecting vitelline ducts from two sides joining near pharynx; no distinct vitelline reservoir. Excretory pore terminal; vesicle not traceable.

DISCUSSION: The relative position of the ovary and testes is subject to variation as in other members of the genus, but characteristic of this species, in addition to the digitiform genital lobe, are the facts that the ovary and testes are always confined to the middle third of the body at the same level as the intestine, and that the proximal portion of the pars prostatica turns back on itself before leading into the straight cylindrical portion.

Prosorhynchus costai Trav.,Artigas & Pereira, 1928

Length 1. by 0.2; body elongate,cuticula with small spines; anterior extremity dilated into form of acorn about 0.13 in diameter as compared with 0.12 width of body below it. Ventral (oral) sucker about 0.046 in diameter distant from anterior end by about 0.3 mm. Intestine sac-like directed foward and medium sized, 0.5 more or less; genital pore posterior,sub-terminal, ordinary; claviform cirrus sac muscular with seminal vesicle distally and posteriorly; testes elongated in longitudinal axis; about 0.13 by 0.08, zones in contact and fields partially superimposed,normal position near the middle of body coming in contact anteriorly with acetabular zone; ovary rounded, medium , about 0.09 in diameter, lateral, pre-testicular, near acetabular zone,overreaching it foward and backward; uterus directed from forward backward forming a small coil; eggs 0.046 to 0.042 by 0.015. Vitellaria lateral consisting of large follicles and few in number,zones in contact in a way to remain above and outside the acetabulum.

Intestine of : Acestrorhamphus sp.
Astyana fasciatus
Salminus hilarii

Locality: S. Paulo and Emas, South America

Komiya & Tajimi, 1940

a) *Prosorynchus echinatus* n. sp. (metacercaria). Body length 0.83 mm, body width 0.31 mm in its metacercaria stage. At the anterior end of the body is found a rhynchus, around the base of which three rows of particuar spines are found. On the surface of the body a growth of minute spines is seen. The growth of these spines becomes sparse in the posterior part of the body. The intestine is saciform and is connected with the oval pharynx. It is situated ventrally about the centre of the body.

The oval testes are situated one behind the other under the pharynx or obliquely to each other about the mid part of the body. The club-shaped cirrus sac is about one third of the length of the body and is found at the posterior part of the body, opening ventrally and subterminally to the exterior. The ovarium is oval and is found on the left side of the pharynx. The vitelline glands are found as small masses, numbering about twenty, at the anterior margin of the intestine and surrounding the latter. The egg is oval in shape and frequently has a short filament-like attachment at its posterior end, measuring 0.22×0.017 mm in diameter. The excretory bladder is an elongated sac and attains to the lower margin of the intestine. It opens to the exterior at the posterior end of the body. The flame cell pattern is 2×[(2+2+2)+(3+3+2)].

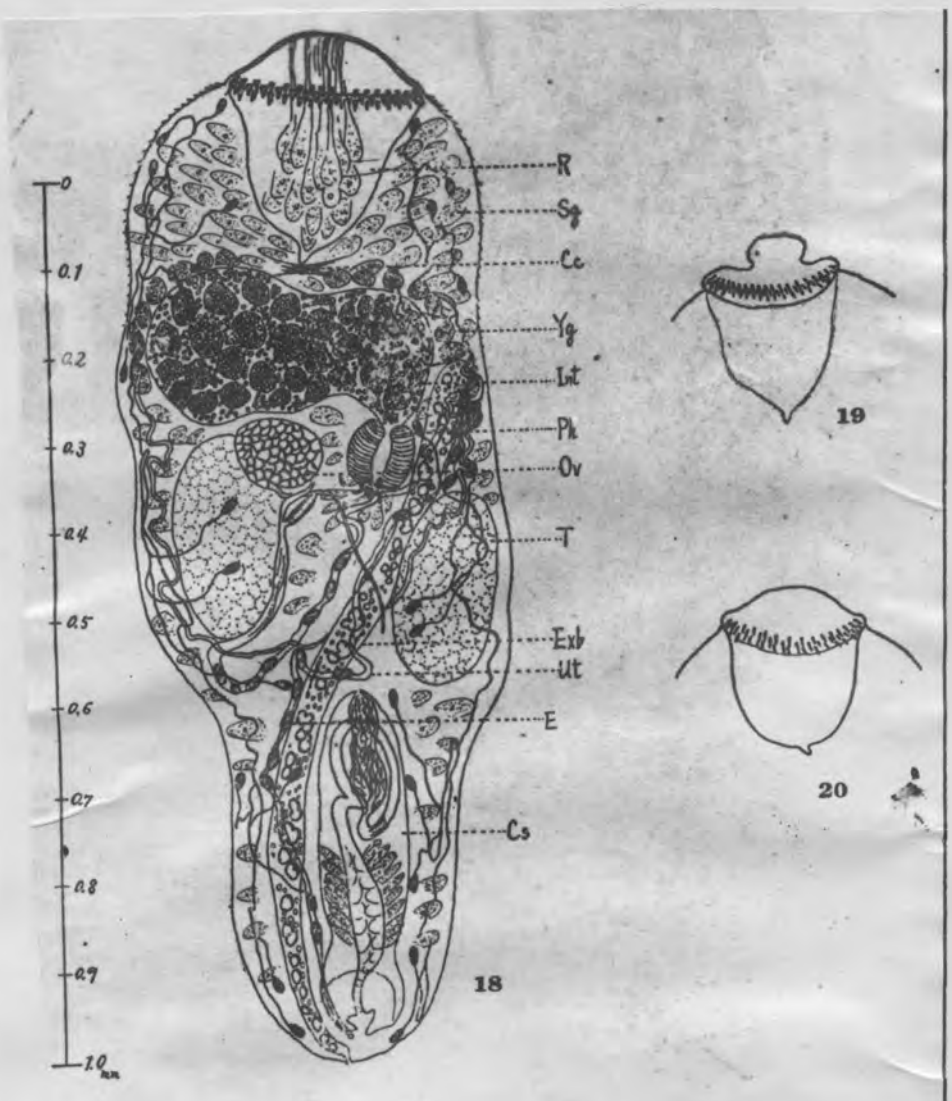


Fig. 18–20. Metacercaria of *Prosorhynchus echinatus* n. sp. and its rhynchus, in a contracted state (fig. 19) and in an extended state (fig. 20).

Komiya & Tajima, 1941

a) *Prosorynchus echinatus* n. sp. (metacercaria). Body length 0.83 mm, body width 0.31 mm in its metacercaria stage. At the anterior end of the body is found a rhynchus, around the base of which three rows of particuar spines are found. On the surface of the body a growth of minute spines is seen. The growth of these spines becomes sparse in the posterior part of the body. The intestine is saciform and is connected with the oval pharynx. It is situated ventrally about the centre of the body.

The oval testes are situated one behind the other under the pharynx or obliquely to each other about the mid part of the body. The club-shaped cirrus sac is about one third of the length of the body and is found at the posterior part of the body, opening ventrally and subterminally to the exterior. The ovarium is oval and is found on the left side of the pharynx. The vitelline glands are found as small masses, numbering about twenty, at the anterior margin of the intestine and surrounding the latter. The egg is oval in shape and frequently has a short filament-like attachment at its posterior end, measuring 0.22×0.017 mm in diameter. The excretory bladder is an elongated sac and attains to the lower margin of the intestine. It opens to the exterior at the posterior end of the body. The flame cell pattern is 2×[(2+2+2)+(3+3+2)].

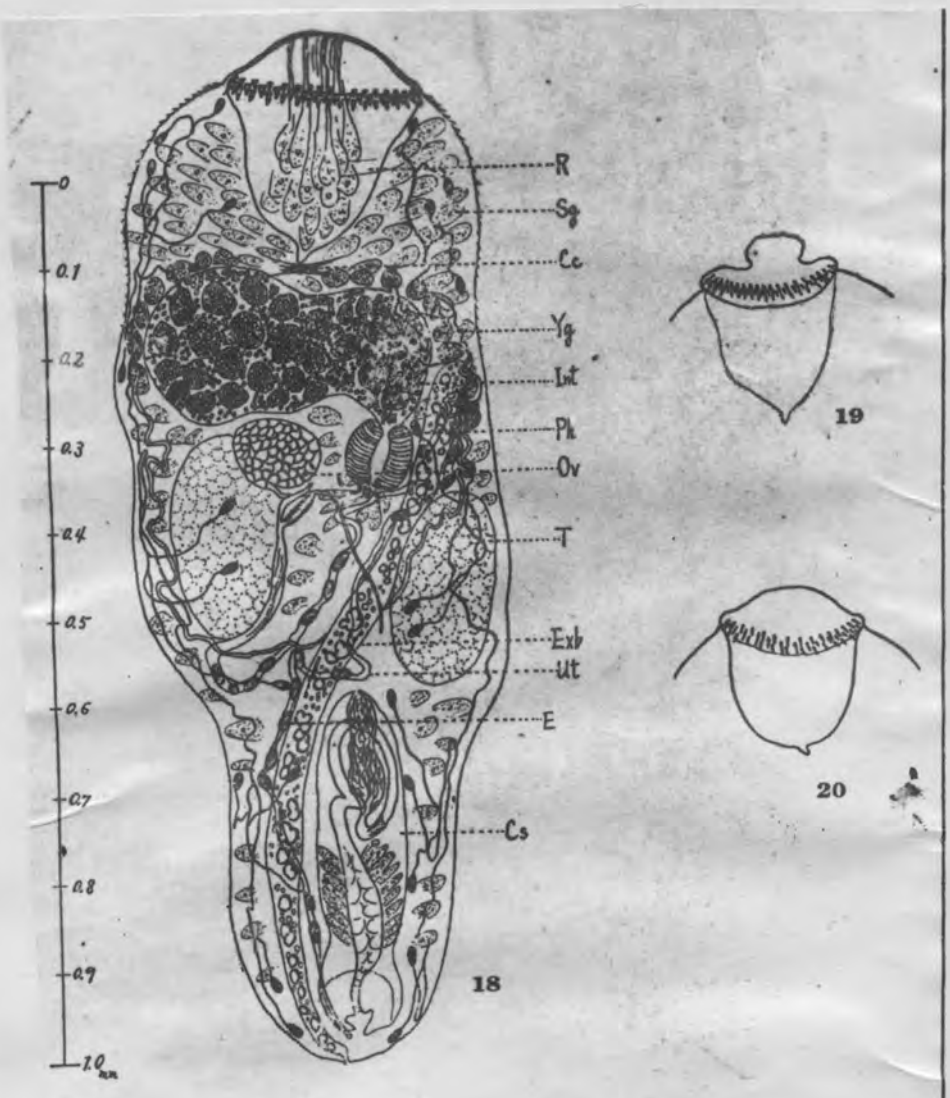


Fig. 18-20. Metacercaria of *Prosorhynchus echinatus* n. sp. and its rhynchus, in a contracted state (fig. 19) and in an extended state (fig. 20).

Prosorhynchus (Skrjabinella) epinepheli Yamaguti,1939

Size 1.25 to 2.35 by 0.5 to 1.
Rostellum inverted cone-shaped,muscular,0.24 to 0.34 by 0.24 to 0.36
Pharynx equatorial, 75 to 100 u in diameter; gut extending to junction ofanterior with middle third or a little more.
Testes subglobular, oblique, left one at level of pharynx.
Cirrus sac 0.4 to 0.7 by 0.1 to 0.23, may or may not reach to posterior testis.
Seminal vesicle S- or 8-shaped.
Genital atrium 0.13 to 0.25 in diameter, opening 0.2 from posterior end in the type.
Ovary rounded, at anterior part of middle third, overlapping right testis partly or entirely.
Vitelline follicles 28, extending in an arch from posterior end of rostellum to level of ovary.
Uterus not reaching anterior to vitellaria; it may reach to posterior end.
Eggs oval, thick-shalled, 28 to 30 by 18 to 21 u.
Excretory vesicle tubular with terminal pore.
Host: Epinephelus akaara
Japan; Inland Sea

In other members of the subgenus except: P.triglae Nicoll,1914 the ovary lies on the side of the posterior testis, while in this species it lies on the side of the anterior testis as in P.triglae. In P.triglae the ovary and testes are posterior to the pharynx.

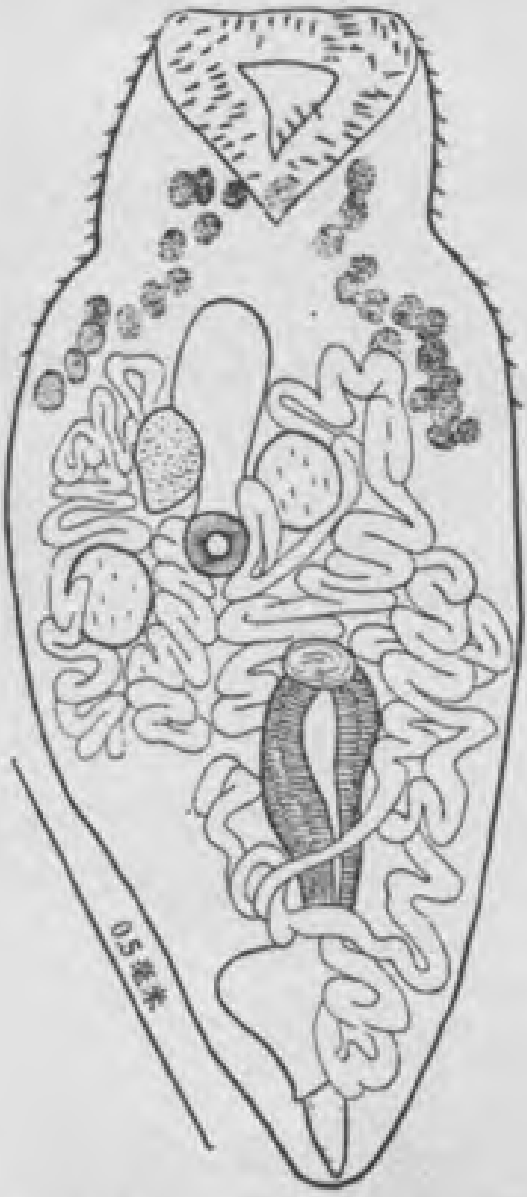


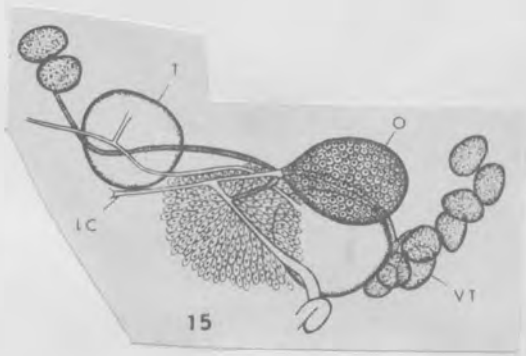
图 3　石斑鱼前实吸虫 *Prosorhynchus epinepheli* Yamaguti, 1939 的腹面图

from Gu and Shen, 1983
Xisha Islands,
Guangdong Province, CHINA

15. *Prosorhynchus epinepheli* Yamaguti, 1939 Yam., 1970
(Fig. 15)

HABITAT: Pyloric ceca of sea bass (*Epinephelus* sp.); Hawaii.

DESCRIPTION (based on nine whole mounts): Body 1.5-2.6 X 0.4-0.9 mm. Rhynchus shaped like an inverted cone, 0.1-0.42 X 0.1-0.4 mm. Pharynx 90-140 μ in diameter, equatorial. Intestine saccular, 0.26-0.55 X 0.18-0.3 mm, reaching forward beyond halfway between pharynx and rhynchus. Testes subglobular, 0.1-0.22 X 0.11-0.26 mm, diagonal in middle third of body, left posterior one at level of pharynx. Cirrus pouch 0.5-0.7 X 0.16-0.25 mm; vesicula seminalis cylindrical, hook-shaped, 0.05-0.24 mm wide; pars prostatica 0.4-0.7 mm long. Genital atrium rounded, 0.24-0.3 mm in diameter, opening ventrally close to posterior end of body.



15

Ovary rounded, 0.1-0.17 X 0.13-0.17 mm, overlapping right anterior testis. Vitelline follicles 24-29 in total number, extending in an arch over uterine coils and intestine. Uterus not extending anterior to vitellarian arch. Eggs oval, thick-shelled, 27-33 X 16-21 μ in balsam mounts. Excretory pore terminal.

Fourteen specimens from pyloric ceca and intestine of *Epinephelus quernus* (local name "hapu' upu'u") gave the following measurements: Body 1.9-2.55 X 0.65-0.92 mm; rhynchus 0.26-0.32 X 0.26-0.35 mm; pharynx 100-110 μ wide; intestine 0.12-0.3 mm wide; testes 0.13-0.2 X 0.11-0.2 mm; cirrus pouch 0.4-0.72 X 0.15-0.31 mm; seminal vesicle 0.12-0.25 X 0.04-0.08 mm; genital atrium 0.06-0.21 X 0.15-0.23 mm; genital pore 0.1-0.2 mm from posterior extremity. Ovary 0.12-0.19 X 0.1-0.19 mm; vitelline follicles 24-30 in number; eggs 28-35 X 17-21 μ in balsam mounts.

DISCUSSION: As compared with my original specimens, the present material shows some exaggerations in measurements due to cover glass pressure, but it agrees well in internal anatomy. In general anatomy the present species resembles *Prosorhynchus aculeatus* Odhner, 1905 (syn. of *Gasterostomum crucibulum* Rud. of van Beneden, 1890), from *Conger vulgaris* from the Belgian coast, in the vitellaria forming a conspicuous arch immediately behind the rhynchus, but in the present species, unlike the other, the genital lobe terminates in three short digitiform processes. It is to be noted that the host fish occurs in the depth of the Hawaiian waters.

Prosorhynchus (Skrjabinella) epinepheli Yamaguti, 1939

Host: Epinephelus akaara (Temm. et Schleg.)

Locality. Inland Sea.

Type and paratype in Yamaguti Helminthological Collection.

Body approximately fusiform, 1.25–2.35 mm in length, with maximum breadth of 0.5–1.0 mm at middle or a little in front of it. Cuticle beset with very minute spines. Rostellum inverted cone-shaped, strongly muscular, 0.24–0.34 × 0.24–0.36 mm, with nearly pentagonal front. Pharynx equatorial, 75–100 μ in diameter. Intestine 0.19–0.35 × 0.1–0.18 mm, extending to junction of anterior with middle third of body or a little further forwards. Testes subglobular, 0.14–0.28 × 0.125–0.25 mm, one obliquely behind the other, the right one usually at anterior part of middle third of body and the left one at level of pharynx. Cirrus pouch 0.4–0.7 × 0.1–0.23 mm, may or may not reach to posterior testis. Vesicula seminalis S- or 8-shaped, at anterior end of cirrus pouch, with maximum width of 36–80 μ at its enlarged proximal portion. Pars prostatica and prostatic cells well developed, the former 0.31–0.55 mm by 0.06–0.102 mm wide. Genital atrium 0.13–0.25 mm in diameter, opening ventrally at its posterior end, 0.2 mm in front of posterior extremity in the type.

Ovary rounded, 0.15–0.21 × 0.12–0.2 mm, at anterior part of middle third of body, overlapping right testis partly or entirely on its dorsal side (in the type it lies anterodorsal to the right testis, but may be dorsal, dorsolateral or posterodorsal to it). Vitelline follicles 28 altogether, extending in an arch from posterior end of rostellum to level of ovary. Uterus not extending anterior to vitellaria; it may well reach to the posterior extremity, where it turns back on itself and after crossing the cirrus pouch dorsally opens into the genital atrium at its base from the right side. Eggs oval, thick-shelled, 28–30 × 18–21 μ in balsam mounts. Excretory vesicle tubular, with terminal pore.

In all the known members of the subgenus *Skrjabinella* except *Prosorhynchus triglae* Nicoll, 1914, the ovary lies on the side of the posterior testis, while in the present species it lies on the side of the anterior testis as in *P. triglae*. In this Nicoll's species, however, the ovary and testes are posterior to the pharynx.

PROSORHYNCHUS

~~Gotonius~~ facilis (Ozaki, 1924)

Body 1.85 to 4.6 by 0.23 to 0.4 mm. Spiny. Rhynchus terminal, protrusible. Pharynx 1/3 body length from anterior end. Oral sucker absent. Intestine a relatively short clavate sac extending anteriad from the pharynx. Testes two, globular, one some distance behind the other, posterior to ovary. Genital pore median, ventral near the posterior end. Cirrus pouch long, with muscular wall, extending to near the posterior testis. Genital papilla projecting into the genital atrium. Ovary globular. Laurer's canal presrnt. Sem. rec. absent. Uterus with ascending and descending limbs, extending from near the rhynchus to the genital pore. Vitellaria lateral, extending fowards from the anterior end of the anterior testis to midway between the front end of the uterine limbs and that of the intestine. Eggs brown, 35 to 40 by 21 to 25 μ. Excretory vesicle extending to ovarian zone.
Host: pyloric ceca and intestine of Inimicus japonicus
Locality: Takamatsu, Japan.

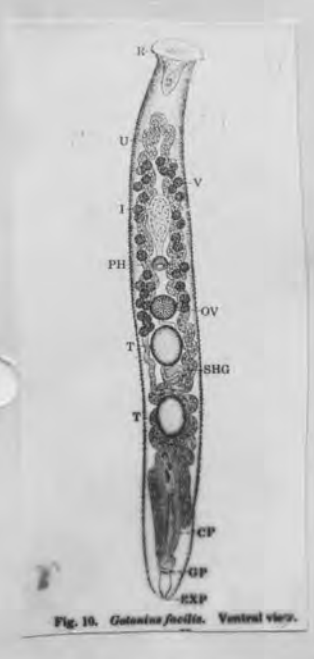


Fig. 10. *Gotonius facilis*. Ventral view.

From Yamaguti, 1934

15. *Gotonius facilis* Ozaki, 1924[1)]

This species is very common in the small intestine and the pyloric appendages of *Inimicus japonicus* (Cuv. et Valenc.) from Toyama Bay and the Inland Sea, and occurs also in the small intestine of young *Seriola quinqueradiata* from the Inland Sea (August 27, 1932) and of *Lethrinus haematopterus* Temm. et Schl. (July 29, 1929).

Since the worm was described by Ozaki in considerable detail, I shall make here only a few remarks on its variation.

The most outstanding variation concerns the position of the pharynx relative to the ovary and testes. In the majority of specimens the pharynx lies in front of the ovary, but sometimes at the level of the ovary or the anterior testis. In relation to the body length it is a little behind or in front of the middle of the body. The cirrus pouch may reach to the level of the posterior testis.

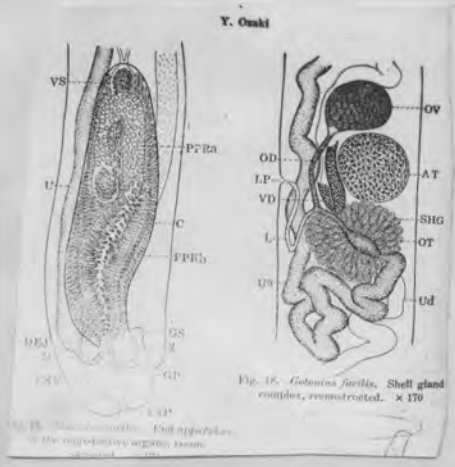


Fig. 18. *Gotonius facilis*. Shell gland complex, reconstructed. × 170

The measuremnts in mm on two whole mounts from *Inimicus japonicus* are as follows: body length 1.72–3.75; rostellum 0.23–0.24 × 0.14–0.17; pharynx 0.065–0.13 × 0.084–0.15; testes 0.09–0.26 × 0.095–0.3; cirrus pouch 0.33–0.56 × 0.11–0.17; ovary 0.12–0.15 × 0.13–0.17; eggs 0.031–0.037 × 0.021–0.024.

The following measurements in mm were made on two whole mounts from young *Seriola quinqueradiata*: body length 2.37–2.65; rostellum 0.25–0.26 × 0.12; pharynx 0.09 in diameter; testes 0.16–0.18 × 0.14–0.2; cirrus pouch 0.5 × 0.1–0.15; ovary 0.1–0.11 × 0.1; eggs 0.033–0.036 × 0.024 mm.

Nagaty says P. apertus is a synonym

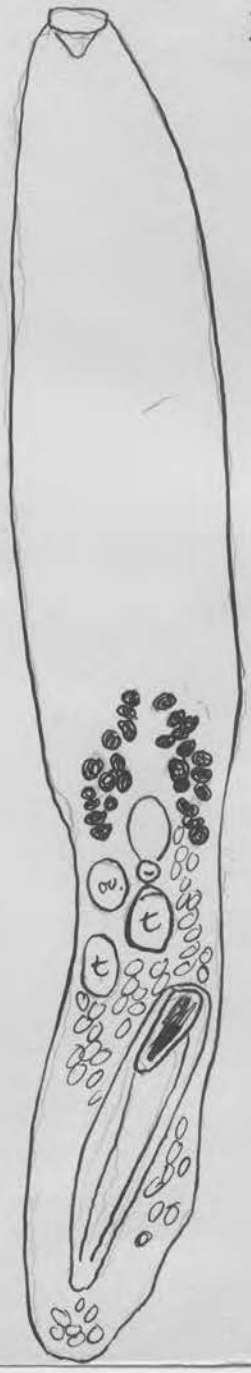
Prosorhynchus freitasi Nagaty, 1937

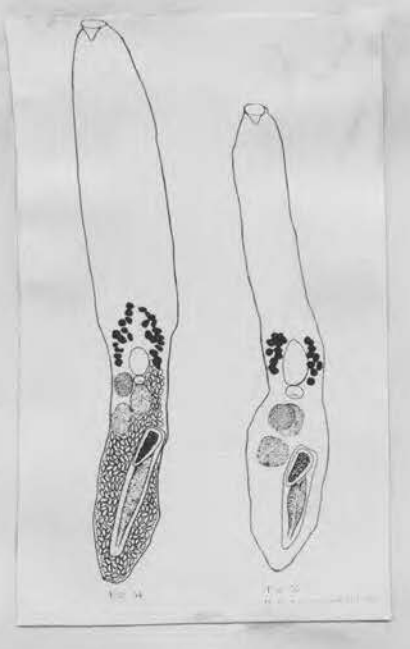
Posterior part cylindrical, anterior part flattened and free of organs.
♀ .919 to 1.87 by 0.153 to 0.306.
Rhynchus small, conical, sometimes hardly seen; length 0.042 to 0.084.
Mouth at junction of middle and posterior thirds of body; pharynx 0.037 to 0.063 in diameter; intestine small, sac-like, anteriorly directed; whole digestive system largely between vitellaria.
Testes oblique, in middle of posterior half of body; cirrus sac elongate, 0.281 to 0.42 by 0.05 to 0.097; a little less than ¼ body length; seminal vesicle ovoid; genital pore subterminal.
Ovary to the right, anterior to posterior testis, forming a triangular arrangement.
Vitelline glands in posterior half of body, of two lateral elongate groups. Each set with 9 to 17 follicles; the two sets may be separate or may unite anteriorly.
Uterus filling most of body posterior to vitellaria, extending to extreme posterior end.
Eggs: 21 to 29 by 17 to 21 μ

Host: Serranus guttatus

Locality: Red Sea

Reference: Nagaty, 1937.
Fac. Med., Egypt. Univ.,
Pub. no. 12





(over)

Prosorhynchus freitasi Nagaty, 1937

HOSTS AND LOCALITIES: *Epinephelus* sp.; Serranidae; New Caledonia. *Plectropomus maculatus* (Bloch); Serranidae; Heron Island; Queensland, Australia.

LOCATION: Ceca and intestine.

NUMBER: Twelve in one *Epinephelus*; one in one *Plectropomus*.

DISCUSSION: *P. freitasi* was first reported from *Serranus guttatus* Peters from the Red Sea. The present specimens agree in general morphology and measurements. New hosts and new geographical localities are thus recorded. From: Durio & Manter 1968

Prosorhynchus gonoderus, ~~new species~~ MANTER, 1940
(Plate 33, fig. 16)

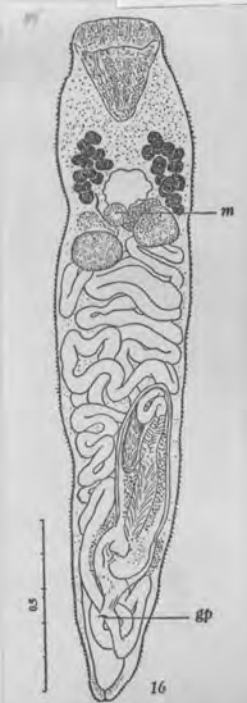
Host: a yellow-spotted grouper
Location: Ceca
Locality: James Island, Galapagos
Number: Many. 2 specimens, immature, of what is probably the same species were collected together with *P. ozakii* from what seemed to be the same species of fish from Isabel Island, Mexico.

SPECIFIC DIAGNOSIS OF PROSORHYNCHUS GONODERUS

Body elongate, somewhat flattened, widest posterior to rhynchus where there is a fairly distinct expansion of the body, tapering gradually from this region to a pointed posterior end. Length 1.480 to 2.295; width 0.380 to 0.510. Rhynchus very well developed, muscular, flattened anteriorly, pointed conelike posteriorly, longer than wide, width 0.247 to 0.307. Mouth far anterior, between ⅓ and ¼ body length from anterior end; pharynx 0.562 to 0.076 in diameter; saclike intestine directed forward. Gonads far anterior, well in front of midbody, clumped together overlapping one another. Ovary subspherical, at level of pharynx, to the left, close to intestine, slightly pretesticular, overlapping dorsally the anterior testis. Vitellaria in 2 lateral groups, not much extended longitudinally, tending to be 2 or 3 follicles wide, extending from level of pharynx to the rhynchus, usually overlapping posterior end of the rhynchus. Posterior limit of vitellaria (which is only slightly more or less than that of the pharynx) never more than ⅓ body length from anterior end of body. Uterus does not extend anterior to ovary but does extend posterior to genital pore. Mehlis' gland posterior to ovary, among the three gonads. Eggs golden yellow brown in color, 27 to 31 by 15 to 19 μ, usually about 27 to 28 by 17 μ, shells rather thick. Testes subspherical, diagonally placed; anterior testis to the left, overlapping ovary; posterior testis slightly separated, to the right, overlapping anterior testis. Cirrus sac large but, because of the far anterior location of the gonads, does not usually reach the posterior testis by some distance (it did so in only one of 16 specimens). Genital atrium large, atrial gland well developed; genital pore some little distance in front of posterior end of body. Several specimens showed recently formed spermatophores. Excretory pore ventral; excretory vesicle conspicuous in most specimens, extending forward to posterior limit of the gonads.

The name *gonoderus* (*gono* = gonads; *derus* = neck) refers to the location of the gonads in the neck region.

Comparisons. This species is notable for the far anterior location of the mouth and of the reproductive organs. The body seems to have elongated posteriorly, leaving these organs anterior, but they are relatively close to the anterior end as well as being very far from the posterior end. The species differs from all others in the genus in this location of the gonads, and from most other species in the fact that the uterus does not extend anterior to the ovary.



FROM: ALLAN HANCOCK PACIFIC EXPEDITIONS, VOL. 2, No. 14.

Also: Epinephelus analogus at Bimini (Sogandares 1959)

Prosorhynchus grandis Lebour, 1907

2. to 2.5 mm. Greatest width near the anterior end, 0.7 mm. The rostellum is 0.20 wide and 0.12 long. The mouth is central with the pharynx measuring 0.10 mm. across.

The intestine, vitellaria, ovary and testes are like P. squamatus. The excretory vesicle reaches to the level of the center of the intestine. The vesicula seminalis is braoder than that of P. squamatus especially the portion outside the cirrus sac. Eggs numerous, 0.033 mm. long, pale yellow.

Hosts: cod and whiting.

"A species very much like P. squamatus but constantly larger and also differing in other particulars.
The uterus does not reach so far foward. valid ?
The excretory vesicle reaches farther foward.

Nagaty considers it a synonym of P. cruciculus
More like squamatus